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ORIGINAL ARTICLES

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Ionizing Radiations*

Their Possible Relation to the Etiology of Some Congenital Anomalies and Human Disorders

By

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(With 13 illustrations)

IONIZING radiations have saved and prolonged the lives of hundreds of thousands of individuals, particularly during the last two decades. They have also stimulated and aided research in directions which would have been impossible otherwise. However, as with many new devices, there are attendant hazards which must be recognized and evaluated lest the long-term damage outweigh the short-term benefits. There are two areas in which this is particularly true, namely in the irradiation of the gonads (germ cells) and the embryo or fetus. It is proposed here to discuss the hazards of such irradiation and the possible relation of x-irradiation to the etiology of congenital anomalies and human disorders.

It is estimated that some 2 million women are given barium enemas and fluoroscopic examinations each year, a large percentage of whom are within the reproductive age range. Each of these examinations involves the possible exposure of the ovaries, and of an embryo, to from 10 to 15 or more roentgens of ionizing radiations. In addition, many children are radiologically examined and their gonads may receive x-ray expo-

sure. Shoe fitting fluoroscopy has been almost eliminated (Kopp '57). In every large hospital there are daily occasions when the gonads or embryo may be exposed to ionizing radiations as in pelvimetry (4 r, Swenson '52), G. I. series (4-50 r, Howland '56), the so-called temporary sterilization (200 r fractionated), treatment of low back pain (500 r), or incidental to tumor therapy when the dose may vary up to several thousand roentgens (see papers by Clayton et al. '57, Durbach '57, Feldman et al. '57, Glass '57, Henshaw '58, Koren and Mandal '57, Lincoln and Gupton '58, a, b, Laughlin et al. '57, Lössl '57, Martin '55-58, Sowby '57, Webster '57, Witten et al. '57). Further, there are over 125,000 physicians in the United States who have access to and use x-ray equipment and who may be encouraged, by the occasional claims of a few (Kaplan '54, Rubin '52, Israel '52) to x-irradiate ovaries directly in order to overcome sterility, in spite of consistent attempts to emphasize the genetic hazards involved (Rugh '54-'58).

The use of ionizing radiations in medical practice is definitely in the ascendancy, and this is to be encouraged because radiology often aids in more accurate diagnosis and more effective therapy. When this increase is

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added to the inevitable exposure from cosmic and natural sources, to the possible contamination from industrial use of atomic energy, and even to more acute exposures in the event of an atomic war, there is every possibility that the human germ cells and embryos may be exposed to more and more ionizing radiations with each succeeding generation, unless precautionary measures are taken. Ellis ('48, '50) stated that our peacetime use of ionizing radiations may conceivably produce effects on the genes (in quality but not in quantity) comparable with those of an atomic bomb. Nevertheless, ionizing radiations, whether from an x-ray tube, radium, or some isotope, are an *extremely useful tool* in the treatment of certain malignancies and the alleviation of pain. Before this valuable tool in diagnosis and therapy becomes a subtle devise for ultimate racial destruction, through gonadal and fetal exposure, it is well that we examine such experimental evidence as we have with respect to the sequelae of such exposures.

Data from human material is very sparse. So far as effects on human heredity are concerned, material will not be adequate for statistical analysis for many decades to come. This is because the human "litters" are small (1+), the gestation period is long (9 months), and there is a low average production $2\pm$ per couple. However, the fundamental laws of inheritance have been worked out very thoroughly on lower forms and other mammals and have been checked and rechecked thousands of times. Abundant statistical data are available from *Drosophila* in the short space of 3 years such that comparable data from human studies would take at least 1,000 years. Fortunately experiments are now in progress at Oak Ridge under the direction of Dr. W. L. Russell ('50-'56) who has a colony of hundreds of thousands of mice, each of whose pedigree is known with respect to seven heritable traits. Mice breed more rapidly than the human but less prolifically than *Drosophila*. Since the mouse is a mammal, the results of these studies, when they are available, may be more convincing to the medical profession than are

the *Drosophila* data. Thus far, all preliminary evidence supports the thesis that the mechanism of inheritance is the same in the mouse as in *Drosophila*. We have reason to believe, from such data as are available from human pedigree studies, that the mechanism of inheritance is the same for all animals, including man. It is true that the mouse has proved to be 15 times more susceptible to the induction of mutations by ionizing radiations than is *Drosophila* (W. L. Russell '50-'56). It is possible that man may be found to be even more radiosensitive, with respect to mutational change, than the mouse. Certainly he has a longer reproductive period during which to accumulate effects in the spermatogonia or oögonia. The reproductive period of a mouse is 2 years and for the human it may be 35 years. Also, there are a much larger number of genes in man to be mutated, a greater target for bombardment by ionizing radiations. But these differences are only quantitative and are in no way to be taken as exceptions to the basic laws of inheritance. Since there are "quantitative" differences, it is probably unwise to extrapolate "safe" or "permissible" levels of irradiation from other animals to man.

X-IRRADIATION OF THE GONADS

Tissue Effects. The effects of ionizing radiations on the gonads appear to be cumulative. A daily exposure of 10 r for 60 days for a total exposure of 600 r to a limited area of the skin of the mouse could be tolerated without any apparent ill effects. A comparable dose applied to the mouse testes would begin to show some effect when the accumulated dose has approached the 400 r level, or after a single exposure of about the same amount (Rugh '52, '54, Rugh and Wolff '57, Fogg and Cowing '52). The effect would be an over-all reduction in testicular tissue due principally to the destruction of the most sensitive cellular elements, namely the early spermatogenetic cells in the process of maturation. Some investigators have even suggested that the testes could be used as the animal's dosimeter since there seems to be an *inverse* relationship between testis size

and radiation exposure (Kohn and Kallman '54, '56). Size reduction is due to loss of spermatogenic elements alone, but since these comprise the bulk of the testis, the organ tends to reflect in size the amount of single or accumulated exposures. A comparable diminution is not found in a similarly irradiated ovary, although fertility tests show that it is from 3 to 4 times as radiosensitive as is the testis. This may be because there are relatively few maturing germ cells at any moment in the ovary to be destroyed. The connective tissue and stroma are not particularly altered. It may also be due to the fundamental morphological differences between the egg and the sperm cytoplasm.

Since the effect of ionizing radiations on the gonads appears to be cumulative, each succeeding exposure affects the same and other cells until even the most radioresistant elements may be damaged. There is a great disparity between the radiosensitivity of the germ cells and of the other gonadal tissue, so that a testis or ovary could be made completely sterile of germ cells but still be recognized as an organ. The testis would retain the interstitial and the Sertoli cells, and the ovary would become a necrotic mass of ovarian connective tissue.

Should the daily exposure stop short of complete obliteration of the germ cells and their precursors, then the testes (but not the ovary) might conceivably become "fertile" again at some later date. This does not imply that any of the radiation-damaged cells have "recovered," for recovery of individual cells from radiation damage is unknown. Rather, it is believed that the most radioresistant cellular precursors of the sperm cells may "survive" and are able thereafter again to produce germ cells which might be functional so far as the fertilization process is concerned. The term "temporary sterilization" is therefore misleading, unless it is explained that the apparent subsequent "recovery" is in fact evidence of some "survival" of formative (primitive) germ cells, from which repopulation can occur in the testes (but never in the ovaries). Such cells

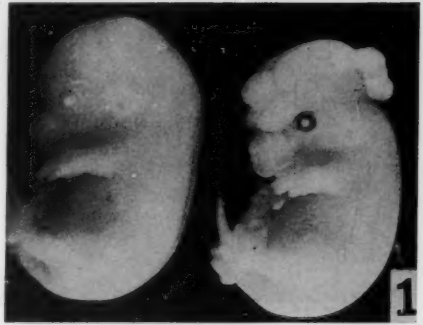


FIG. 1. *Genetic Effects.* Mouse fetuses at 17.5 days one of which shows exencephalia (cerebral hernia) which resulted from x-irradiation of its grandfather's testes. No anomalies in first generation after exposure. (See Snell '39, Rugh and Grupp '59).

would inevitably carry the maximum of induced mutations.

For a half a century, at least since the published work of Halberstadter in 1905, it has been suspected that direct, low-level ovarian x-irradiation might help to overcome sterility in some instances, due possibly to the temporary resultant hyperemia. This practice has been followed by Beclere ('09, '26), Kaplan ('28-'56), Israel ('52), and Rubin ('26, '52) and possibly by a few others. Kaplan ('53) reports his observations with 293 children resulting from 252 x-irradiated ovaries over a period of 20 years. Just how many hereditary lines have thus been altered by ionizing radiations cannot be determined. The immediate result is the reproductive satisfaction of some 35% of the exposed sterile individuals. However, it is important that we consider the long term consequences of such a practice, particularly with respect to the effects on the hereditary line (Rugh '54-'58).

Genetic Effects. The cumulative effect of ionizing radiations on the gonads is even more dramatically evident in genetic studies, since there is apparently no threshold for the radioreaction of genes. Muller ('27-'54) believes that a single ionization may be mutagenic. There seems to be a direct linear relationship between the total dosage and the number of a certain type of mutations pro-

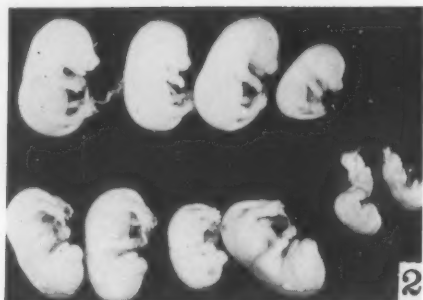


FIG. 2. *Genetic Effects.* Entire litter of mice in position as found in uteri showing two dead fetuses, two grossly stunted, and others variable. The grandfather of this litter had his testes x-rayed, and no anomalies appeared until this second generation. The F_1 hybrids were outcrossed to normal mice so that the genetic influence of this irradiation was roughly 25%.

duced by x-raying *Drosophila* from 25 r to 1,000 r (Evans '49). Mutations are permanent, heritable changes which occur in the hereditary units (genes). With increasing exposure of the same cells more and more genes are caused to mutate, and the progeny will be the more affected.

It is estimated that the human sperm or ovum may contain as many as 30,000 or more genes (Spuhler '48). A single gene has been roughly estimated to measure from 3 to 24×10^{-8} u³ (Catchside '47) and since each roentgen produces 1.6×10^{12} ion pairs per cm³ of tissue (or 1 ion pair per cubic micron of tissue), it is not difficult to see that with increased irradiation there will be an increase in the number of genes ionized and affected (mutated). It has been estimated that the normal expected rate of spontaneous mutations may be doubled by a germ cell exposure of from 30-80 r (average 50 r) in the human. This is approximately the dose to the ovary used by Kaplan ('53). But genetic effects are rarely revealed in the first generation following the exposure of germ cells (gonads), only in subsequent progeny. The present generation of human beings carries a load of genetic mutations brought about in the germ cells of its ancestors. Many of these mutations are deleterious

to the health and survival of the carriers, as is evident by the fact that every fifth person, on the average, dies from some inherited genetic cause. In addition there may be many characters which debilitate but do not kill, and with which the medical profession is constantly concerned (see appended list). When experience reveals that probably 99% of all radiation-induced mutations are deleterious, it must be apparent that exposure of the gonads to ionizing radiations can only add to the already heavy load of unfavorable inherited tendencies. Muller ('54) refers to such radiation-induced mutations as inevitably causing a "genetic death." He reasons that if the mutation is so slight that it reduces the life expectancy by only 1% (say a slight increase in blood clotting time) but this gene is carried through 100 generations ($100 \times 1\% = 1$) then the total effect of that mutation is 1 ultimate death. It threatens every descendant who carries the mutation.

Tables 1 and 2 list some 198 human conditions which challenge the medical profession. All of them have exhibited evidences of heritability either as dominant or recessive tendencies. Each of them represents a mutation of a gene (or genes) from the normal condition.

X-irradiations have not been known to cause any new mutations, conditions previously unknown. They merely increase the frequency of their occurrence. It is not to be presumed that x-rays will cause any of the specific anomalies listed, but it is certainly within the realm of possibility. Further, it is conceivable that the sudden appearance of some of these dominant disorders, in an hereditary line where they were unknown, may have been due to some prior irradiation of an ancestral germ cell.

There are in addition many physical traits or conditions which are mutational and which could be considered as innocuous, such as the ability to taste phenylthiocarbamide (P. T. C.) paper, blue eyes instead of brown, red hair instead of black, absence of a collar-bone, double-jointedness, hammer toes, extra fingers or toes, susceptibility

TABLE 1. HUMAN CONDITIONS INHERITED AS DOMINANT MUTATIONS*

Achondroplasia	Ichthyosis vulgaris
Allergic diseases, various	Icterus, hemolytic
Alkaptonuria (black urine)	Jaundice, acholuric
Amputations, congenital	Jaundice, congenital hemolytic
Amyloidosis	Jointedness, double
Anemia, pernicious	Keratosis, follicularis
Anemia, sickle-cell	Keratosis, palmaris
Anhidrotic ectodermal dysplasia (sex linked)	Labyrinthine deafness
Aniridia	Lagophthalmus
Angioneurotic edema	Legg-Perthe's disease
Apical dystrophy	Madelung's deformity
Astigmatism	Manic depressive psychosis
Ataxia, cerebellar, hereditary	Migraine (?)
Ataxia, Friedreich's (?)	Mongolism (?)
Baldness (sex limited-D in males, R in females)	Mucosal catarrh: childhood
Blindness, congenital night	Monilethrix
Blood groups: A or B over O, MN and Rh	Muscular dystrophy
(38 plus characters heritable)	Myotonia dystrophica
Blue sclerotics	Nephrosclerosis
Brachydactyly	Neurofibromatosis, multiple
Brown eyes	Nystagmus
Cartilaginous exostoses, multiple	Otosclerosis
Cataract (post natal-some)	Ovalosytosis with hemolytic syndrome
Cerebellum, primary degeneration of	Palate, cleft (with hare lip)
Clinodactyly	Paralysis agitans (60%)
Coloboma (macular)	Paralysis, family periodic
Craniofacial dysostosis	Patella, absence
Cystinuria (cystine diathesis)	Pelger's nuclear anomaly
Darier's disease	Pemphigus, benign familial
Dementia praecox (method unclear)	Pentz's syndrome
Diabetes insipidus	Peroneal muscular atrophy
Diabetes, renal (blycosuria)	Phenylketonuria (?)
Distichiasis pterygium	Phlebotaxis
Dystrophia myotonica	Pick's disease, late onset
Ear, cat's	Pili torti
Ectopia lentis	Pityriasis rubra pilaris
Eosinophilia	Polycythemia vera (?)
Epidermolysis bullosa	Polydactylism
Epilepsy (some forms)	Polyneuritis, progressive hypertrophic
Epiloia	Porokeratosis
Epithelioma adenoides cysticum	Porphyria (?)
Fragility of bones	Psoriasis
Fundus dystrophy (age 40 plus)	Recurrent bullous eruptions of feet
Glaucoma	Retinoblastoma
Goiter, endemic (?)	Skin, spotted white
Gout (may be sex limited)	Spina bifida (?)
Hair, dark brown, black, curly	Spondylitis, ankylosing
Hand, split (lobster claw)	Symphalangism
Hip, congenital dislocation of	Syndactyly
Huntington's chorea	Telangiectasia, hemorrhagic
Hyperopia	Tremor, familial
Hypospadias	Trophodema
Hypotrichosis, universalis	

* See books by Sorsby, Race and Sanger; Muller, Little and Snyder. slr—sex linked recessive

TABLE 2. HUMAN CONDITIONS INHERITED AS RECESSIVE MUTATIONS

Afibrinoginaemia	Hair, blond or albino
Albinism (slr)	Hand-Schuler's disease
Alkaptonuria	Hirschsprung's disease
Amaurotic idiocy (lethal)	Hydrophthalmus
(Tay-Sachs Disease)	Hydrops, congenital
Amyotonia congenita	Ichthyosis (various types) (slr)
Anemia, erythroblastic	Ichthyosis faetalis (lethal)
Anemia, hypochromic (slr)	Idiopathic familial methemoglobinaemia
Anemia, microcytic (slr)	Idiopathic spontaneous hypoglycaemia
Anemia, sickle-cell (?)	Iris, pigment degeneration of
Anhidrotic ectodermal dysplasia (slr)	Ivy, susceptibility to poison
Anophthalmia	Keratoconus, some types
Arthritis, hemophilic	Keratosis follicularis spinulosa (slr)
Ataxia, Friedreich's (?)	Kidney, congenital cystic
Baldness, pattern (in females)	Laurence-Moon-Biedle Syndrome (sex limited)
Blindness, color (slr)	Lopoidosis of the skin
Blindness, day (slr)	Megalocornea (slr)
Blindness, night (slr)	Microcephaly
Cerebral sclerosis of Schilder, Merzbacher and Pelizaeus	Microphthalmos
Chorioideraemia	Morquio's disease
Cryptophthalmus (slr)	Muscular atrophy, infantile (lethal)
Deaf mutism (some forms)	Myopia
Diabetes mellitus	Neuritis, hypertrophic
Dwarfism (some types)	Nieman-Pick disease (lethal)
Enuresis	Nystagmus (slr)
Epidermolysis bullosa (lethal)	Ochronosis
Epilepsy, myoclonic	Optic atrophy, Leber's
Erythroblastosis	Paralysis, spinal (certain types)
Feeble-mindedness (some forms)	Peroneal atrophy (slr)
Foot, club	Phenylketonuria (?)
Friedreich's ataxia	Porphyria (?)
Fructosuria (laevulosemia)	Retinitis pigmentosa (slr)
Gargoylism (lethal)	Scarlet fever, susceptibility to
Gaucher's disease	Schizophrenia
Glioma retinae (lethal)	Spastic, hereditary
Glycogen storage disease (von Fierke's)	Spina bifidia (?)
Goiter exophthalmic (?)	Thalassaemia major (Cooley's anemia)
Gower's muscular atrophy (slr)	Thomson's disease (myotonia congenita)
Hemachromatosis (pigmentary cirrhosis)	Tyrosinosis
Hemophilia (slr)	Wilson's disease (lenticular degeneration)
	Xeroderma pigmentosa

to poison ivy, and a host of other characters which help us to distinguish one individual from another. But among the 30,000 or more genes which control physical traits in man there are others which could be mutated to cause the progeny to inherit a tendency to develop diabetes, Huntington's chorea, certain types of feeble-mindedness, hemophilia, glaucoma, muscular dystrophy, Leber's disease, Friedreich's ataxia, or any other of a long list of human ills that appear to be inherited. Some of the mutations such as amaurotic idiocy or gargoylism kill at an

early stage. Probably the most subtle of the mutations are those which involve the central nervous system. Some of these may only lower the potential I.Q., which fact could not be determined since there are no controls. These may not be manifested until later in life or under stress. But each condition may be present by virtue of a single inherited genic (mutational) change in an otherwise normal gene, brought about at some time in the past, not necessarily the immediate past. Each individual is therefore a mosaic of inherited potentialities, some

favorable and some unfavorable with respect to survival. Ionizing radiations are the most effective means known to man of bringing about such changes in the germ cells of any individual. It may be regretted that such changes are largely deleterious rather than lethal, thereby contaminating rather than eliminating the particular hereditary line.

"But," says a physician, "I have x-rayed the ovaries of many sterile women who have subsequently conceived and delivered normal children. Now there are beautiful grandchildren from these irradiated ovaries to prove that your theories are all wrong."

The difficulty relating to such a statement lies in the fact that it cannot be supported by experimental proof, for there are no controls. There is no way to know in what ways a particular child might have differed had it not come from an x-rayed ovary or testis. Only in animal experimentation, where large numbers and controls are possible, can one make a positive statement about the consequences of gonadal irradiation. Someday circumstances may present us with an ideal experimental situation such as would be provided by a pair of identical twins, and, for some reason, the gonads of the one would be x-irradiated while the gonads of the other remain as the "control." Even here the data would not be adequate because the numbers of offspring would be small and the spouses would be different, making different genetic contributions. When a pediatrician pronounces a child, who comes from an x-rayed ovary, as "normal" purely on the basis of a physical examination, we must realize that the term "normal" can have great latitude. It could include all children without overt malignancy, and within an I.Q. range of from 70-140, and yet destined to die by a new mutation not present prior to the irradiation, nor evident at the time of examination.

There is a second type of statement which one hears, namely that a mutation or genetic death that is revealed some 10 or 100 generations hence "is no concern of mine as long as I can help this woman to have her baby." This attitude can be understood but it cannot

be justified in the face of the avowed purpose of the medical profession to alleviate human ills. The ethics of the situation might be debated, but there appears to be little choice, since the woman can only deteriorate her hereditary line by allowing her ovaries to be x-irradiated. She is helpless to improve the line by x-irradiation. If she allows the physician to x-ray her ovaries in the hope of overcoming sterility, she and/or the physician may be held accountable by history for the possible consequences. As Swenson ('54) writes, "It may be that we will find, many generations hence, that the use of irradiation at all, for any purpose, *during the period of fertility*, was unwise and will have done irreparable damage to the human race."

There is a severe congenital anomaly involving the central nervous system known as exencephalia or cerebral hernia which has been produced in mice by x-irradiating the spermatozoa of the grandfather (Snell '39, '41, Rugh and Grupp '59). The immediate offspring of such irradiated spermatozoa appear to be normal and are fertile, but when mated with unirradiated mice the next generation will have offspring with various types of anomalies, including this one of exencephalia (see Fig. 1). While the dose may vary (600 r+) it would be unwise to presume that there is a threshold for heritable changes even such as these. The full consequences of tampering with the germ line may not be realized for several or many generations of possible survivors.

THE SIGNIFICANCE OF HUMAN MUTATIONS

There is every reason to believe that genic mutations occur in man just as they do in the experimental animals, and that ionizing radiations are not the exclusive but are the most effective means of bringing about such changes. Man's method of inheritance, by every test, is "Mendelian," even as it is for all animals and plants whose mechanism of heredity has been studied. This simply means that each individual is made up of paired influences, contributed by the two parents; that, if a mutation has occurred, the paired influences are thereafter no longer



FIG. 3. *Pre-implantation embryonic effects.* Entire litter and two resorptions following 200r at 0.5 day (prior to first cleavage) showing one exencephaly beside another litter member which appears to be normal but is stunted. Direct effect of x-rays on the fertilized egg.

equal, and one will tend to "dominate" or otherwise affect the other; and that these tendencies are transmitted unchanged from generation to generation, barring further mutations of these genes.

For example, if one parent has hereditary manic depressive psychosis (or diabetes insipidus) which seems to be dominant, it can be expected that half of the offspring will



FIG. 4. *Pre-implantation embryonic effects.* Two members of litter receiving 25r at 0.5 day after conception and 25r at 3.5 days, both exposures before the time of implantation of the embryo. Aggregate exposure of 50r caused cerebral anomaly in one member of litter, but x-irradiation occurred prior to the completion of blastulation.



FIG. 5. *Pre-implantation embryonic effects.* Single exposure of 50r at day 2.5, at about 16+ cell stage, caused entire (small) litter of three to develop similar severe anterior end congenital anomalies involving more than just the brain. Posterior structures appear to be quite normal.

exhibit the same condition. The couple could produce four or five or more "normal" offspring before producing one with manic depressive psychosis, but there would always be a 50-50 possibility that each child would inherit the tendency. The actual ratio would approach the theoretical prediction of 50% only if the children issuing from this pair should number 20-30 or more. Thus any child from an x-irradiated ovary might exhibit this dominant mutation or any of the 197 other conditions listed. Every cell of the child's body would contain a gene (or genes) for this psychosis, even though only the nervous system would exhibit the abnormality. Most serious, however, is the fact that each primitive germ cell of this individual (primitive sperm or ovum) would similarly carry such a tendency, possibly to be expressed in succeeding generations so long as it survives in progeny. This is an obvious situation, resulting from the fact that every cell of the adult individual arises from pre-existing cells by equal nuclear division, originating from the fertilized egg.

Unfortunately, most mutations are not "dominant" and cannot be as readily spotted as is this one. Most mutations are known as "recessive" (hidden), masked by the "normal" condition to varying degrees. Appended is a list of some 87 such human recessive mutations. Even though they are masked, they are believed to debilitate to

FIG. 6. Pre-implantation embryonic effects. Exposure of 50r at day 3.5, still prior to implantation in the uterus, showing four members of litter, one of which has exencephalia, and one is a dead fetus, while two others appear to be normal. However, when compared with control (unirradiated) at the right, these apparently normal fetuses are seen to be stunted.

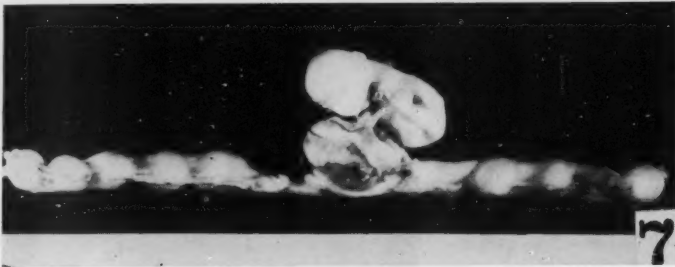
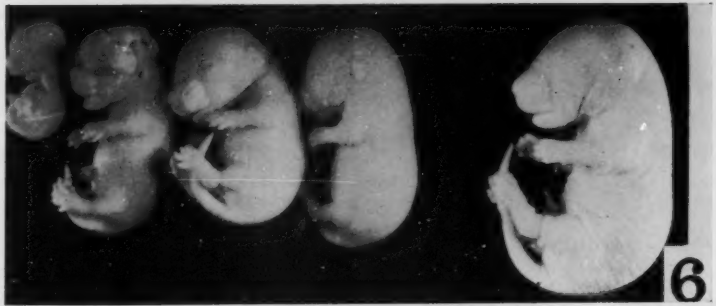


FIG. 7. Pre-implantation embryonic effects. Exposure at the same time as for Fig. 6 (3.5 days) but the dose was 200r x-rays showing nine dead and resorbed embryos within uterine horns, and one stunted fetus.

varying degrees whenever present, in such a manner as lowering vitality, shortening life, etc. They are passed along to the progeny unchanged, just as are the "dominant" mutations. There is always the chance that one recessive mutant may become paired with its like and give the individual the full blown human disorder for which it is responsible.

Dr. A. Howard ('52) says that "in thinking of the genetic effects of radiation we must get away from the idea that we can

assess the damage done by looking at the children, or even the grandchildren, of individuals who have been irradiated." Such a statement is made by one trained in genetics.

Swenson ('54) is even more cautious in stating: "any amount of radiation to either patient or personnel which is not necessary should always be considered too much." Further, he says, "We must never relax in being cautious in applying radiation to any patient at any time, but *particularly during*

FIG. 8. Pre-implantation embryonic effects. Bicornuate uteri of mouse which was exposed at 3.5 days to 25r and 6.5 days to an additional 25r making aggregate 50r, one exposure before and the other after the time of implantation. In this case every litter member was killed in utero and substantially resorbed. Day 3.5 is generally critical.

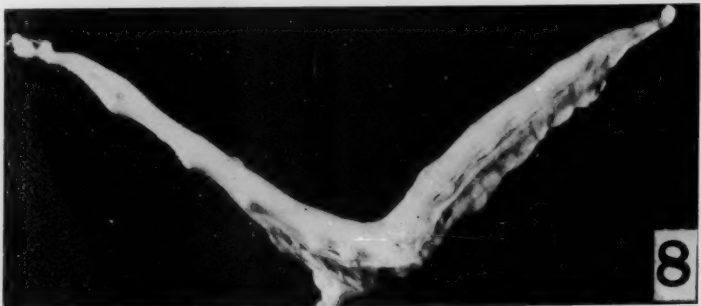




FIG. 9. *Pre-implantation embryonic effects.* Three members of a litter of 9 which was exposed to 25r on day 4.5 and an additional 25r on day 7.5 showing one member with extensive brain hernia while its litter mates appear normal (but are slightly stunted). The protrusion consisted of neural tissue containing ependyma, neurocoele, and choroid plexus.

the period of fertility and more specifically to women before the menopause."

It would be safe to predict that no experimental geneticist, and probably no research trained radiotherapist, would seriously consider allowing his wife to have her ovaries x-irradiated in order to overcome sterility, even if immediate fertility could be guaranteed. The price of individual gratification, in the remote event that sterility is overcome by x-irradiation, is the permanent and unfavorable alteration of the hereditary line. The probability that the irradiated person would not be living when the progeny meet genetic disability or death does not lessen the basic responsibility.

In order to summarize the differences between x-irradiation effects on somatic tissue (e.g., muscle, skin) and the contrasting effect of such irradiations on the germinal tissue (e.g., sperm or ova) a comparative table is presented (Table 3). The emphasis is essentially that the somatic effects are transient while the germinal effects are permanent, surviving as long as the germinal line survives in descendants. The continuity of protoplasm from one generation to the next is solely by way of the sperm and egg cells, and any (genetic) damage to them by ionizing radiations may survive as long as the particular protoplasmic line survives.

X-IRRADIATION OF THE EMBRYO

Until recently it has been assumed that the critical period of embryonic radiosensitivity occurred at about the time of appearance of the organ precursors, or *anlagé* (Russell, L. B. - W. L. Russell '52-'56). It is true that 200 r x-rays delivered at the time of early neurogenesis of the mouse embryo will produce 26% cerebral hernias, or exencephalies (Fig. 11). However, it has since been shown that this same congenital anomaly of the central nervous system can be produced by x-irradiating the embryo *at any time* prior to neurogenesis, even at a time before the



FIG. 10. *X-irradiation during neurogenesis.* Cerebral anomaly produced by 150r at 9.0 days after conception, at a time when neurogenesis is at its peak. However, this anomaly is similar to that found in Fig. 5 which was due to irradiation during blastulation at day 2.5 long before implantation.

TABLE 3. SOMATIC VS. GERMINAL EFFECTS OF IONIZING RADIATIONS*

Criteria	Somatic Effects	Germinal (Genetic) Effects
EFFECTIVE RADIATIONS	Neutrons, ionizing radiations, Alpha plus beta particles	Same: plus ultra violet
MOST EFFECTIVE RADIATIONS	Depends on penetration desired	All that reach germ cells. Neutrons for chromosomes: x, gamma, U.V. for genes
RADIOSENSITIVITY	Variable: 12r-10,000r (reps)	Extremely radiosensitive
THRESHOLD DOSE	12 \pm x-rays	None: 1 ionization
PERMISSIBLE DOSE	0.3 r/week, whole body	None to gonads
RESULTS OF IRRADIATION	Predictable	Unpredictable
RADIOMIMETRIC EFFECTS	N. mustard, T.E.M., antifolic acids, aminopterin	N. mustard, allyl isothiocyanate, ethylurethane, formaldehyde
EFFECT OF COSMIC AND NATURAL RADIATIONS	None perceptible	May contribute to spontaneous mutations
SEX DIFFERENCES IN SENSITIVITY	Probably none. In whole body irradiation males more sensitive	None
LATENT PERIOD FOR EFFECT	Hours to days	Only succeeding generations
DURATION OF EFFECT	Transient to permanent, one generation Possible	May involve all surviving progeny Largely impossible, some anomalies can be surgically modified
RECOVERY (REPAIR OR REGENERATION)	Possible	Possibly mutagenic, low percentage
EFFECTS OF DIAGNOSTIC RADIATIONS	Probably none, exposure low	99% probability mutations induced are harmful, 30r plus, doubles spontaneous rate
THERAPY EFFECTS	Beneficial, tumoricidal	
FRACTIONATION OF DOSE	Greater tissue tolerance	No effect on tolerance, effects cumulative
SUSCEPTIBLE TISSUES	All, variously	Spermatogonia primarily, all maturation stages
VISIBILITY OF EFFECT	Macroscopic (e.g., erythema)	Ultra-microscopic, invisible
AREA AFFECTED	Exposed area primarily	Every cell of derived organism and surviving progeny may carry a mutant
SUB-LETHAL EFFECTS	Neoplasms, cataracts, shortening of life in exposed individual	Ill health and reduced survival in progeny only, most mutations deleterious
LETHAL EFFECTS	Exposed tissues only, unless extensive radiation	Ultimate "genetic" death of one individual in progeny for each mutation
EFFECT ON HEREDITY	None	All progeny may be affected
TRANSMISSION OR PROPOGATION OF EFFECT	Never	As long as progeny exist
EFFECT OF WHOLE BODY IRRADIATION-150r	Shortens life approximately 6 months	Triples "spontaneous" mutation rate in exposed germ cells
EFFECT ON EXPOSED INDIVIDUAL	Maximum, therapeutic, also hazardous	None, innocuous
EFFECTS ON CIVILIZATION	None-Effect on exposed individual only	Great, entire hereditary line

* While the author assumes responsibility for this table, he readily acknowledges the counsel of Dr. H. H. Stranskov in certain details.



FIG. 11. *X-irradiation during neurogenesis.* Entire litter as found in the uteri at 17.5 days following exposure to 200r at 8.5 days, the period which yielded the highest percentage of these cerebral anomalies of exencephalia. Note 7 out of 9 brain hernias. Those apparently "normal" litter mates can hardly be expected to be truly normal since they were subjected to the same x-irradiation.

first cleavage and within hours of conception. Further, while exposures of less than 50 r did not produce this particular anomaly, exposures of 5 r did kill some embryos in utero, so that the early mammalian embryo is indeed extremely radiosensitive (Rugh and Grupp '59).

In an earlier study (Rugh and Wolff '55) it was shown that if the mouse embryo at 12.5 days was exposed to 150 r x-rays microphthalmia would result to the extent that the volume of the eyes would be reduced by 30%. If the exposure was 250 r the volume of the resulting eyes would be reduced by 50% so that there appears to be a direct relationship between the degree of microphthalmia and x-irradiation of that particular time in development. While lower exposures were not similarly analyzed, it is proper to assume that lower doses would have their effect in producing embryos deficient in retinal elements. In like manner we now believe that irradiation-damaged cells cannot recover and embryos containing such cells are deficient with respect to their development. This may apply to all tissues, but neurological deficiencies are graphic and have been demonstrated.

In the photographs of x-irradiated litters containing individuals with cerebral hernias there are almost always some that appear "normal." However, if these are compared directly with the unirradiated controls they will be seen to be reduced in size, the amount roughly related to the degree of irradiation insult during embryonic development. Nevertheless, it would be unwarranted to assume that litter mates of exencephalies are without irradiation-effects, having been exposed to the same field of ionizing radiations. Normality, then, determined on the basis of a gross analysis, may be seriously in error especially when we now believe there may be neurological effects on a functional level which would not necessarily have any histological corollaries.

In another recent study (Rugh and Jackson '58) it was shown that the embryonic



FIG. 12. *X-irradiation during neurogenesis.* Member from Fig. 9 shown enlarged and in left side view to show extent of herniation and protrusion.



FIG. 13. *X-irradiation during neurogenesis.* Hybrid litter from CF1 \times C 57 black cross x-irradiated to 200r on day 8.5 showing graded size variations, exencephalia, cerebral vesicle, and dead fetus. (Reactions of hybrid embryos being currently studied on quantitative bases).

testis of the mouse was far more radiosensitive than was the embryonic ovary, in terms of subsequent fertility. This is just the reverse of the situation in the adults, where the ovary is the more radiosensitive. It should therefore be remembered that when the embryo, or the later fetus, is x-irradiated, there is always the possibility of not only affecting its ultimate fertility but of causing mutations in the germ cells of the embryonic gonad, long before its full development. Since the relatively few primitive germ cells in the embryo will give rise to the many functional germ cells of the adult, the genetic effects of embryonic x-irradiation are probably multiplied many times.

In recent mouse studies (Rugh and Grupp '59) it was found that 5.7% of normal, unirradiated embryos of white Swiss CF1 \times CF1 crosses died in utero and were resorbed, possibly due in some cases to lethal mutations "spontaneously" derived. Less than 0.3% developed to fetal stages before dying, and none in 630 implantations showed any cerebral anomaly. Nevertheless, when the mouse embryos were exposed to as little as 50 r x-rays at any time before 9.5 days gestation, an average of 12.3% died in utero and 2% developed the severe anomaly known as exencephalia, or cerebral hernia. It was shown that the most sensitive period with respect to uterine death and resorption (42% after 50 r) was before the first cleavage, at 0.5 day after conception. Exencephalia could be produced by x-irradiation at any time prior to the completion of neurogenesis (9.5 days).

Since fractionation of x-rays is common practice in tumor therapy, a study was made of the effect of 50 r fractionated to two exposures of 25 r each at various times during the 0.5 to 8.5 day sensitive period. It was found that there was no change in percentage of uterine deaths and resorptions, but with single exposures there was greater incidence of exencephalia. While among the unirradiated controls there were 95% normal fetuses, the "apparently normal" fetuses following 50 r x-irradiation were reduced to 85% whether the exposure was single or fractionated. It is contended that these "normals" could hardly be expected to be truly normal when they had litter mates that were either killed or developed severe cerebral hernias. When the exposure at 0.5 day was lowered to 5 r there still appeared 15% uterine deaths, some 9.3% more than among the controls. Thus, it appears that the mammalian embryo is exceedingly radiosensitive, particularly in the early stages. It should be remembered that the human embryo is born prematurely, that its cerebellum does not complete development for several weeks after birth, so that the act of birth does not clearly distinguish between a period of radiosensitivity and one of radioresistance. There have been a number of congenital anomalies reported in humans which have been attributed to fetal irradiation (Table 4).

On the basis of these and other studies it has been recommended that pelvic irradiation of the human female be restricted to the

TABLE 4. A PARTIAL LIST OF ANOMALIES ATTRIBUTED IN THE LITERATURE TO EMBRYONIC OR FETAL X-IRRADIATION IN THE HUMAN

1. Microcephaly (Most frequent also from Hiroshima and Nagasaki)	16. Nystagmus
2. Hydrocephalus	17. Stillbirth increase
3. Poroncephaly	18. Decrease live birth weight
4. Mental deficiency	19. Neonatal and infant death increase
5. Mongolism	20. Ear abnormalities
6. Idiocy	21. Spina bifida
7. Head ossification defects	22. Cleft palate
8. Skull malformations	23. Deformed arms
9. Micromelia	24. Clubfeet
10. Microphthalmus	25. Hypophalangism
11. Microcornea	26. Syndactyly
12. Coloboma	27. Hypermetropia
13. Strabismus	28. Amelogenesis
14. Cataract	29. Odontogenesis imperfecta
15. Chorioretinitis	30. Genital deformities

period before the 9th day following the onset of menstruation in order to avoid the possibility of irradiating an unrecognized early pregnancy.

CONCLUSIONS

Extrapolations of data from mouse directly to man cannot be made, but results on the rodent can be suggestive of ultimate findings with the human. X-irradiations of the testes, the ovaries, the embryo or the newborn at any stage may have serious consequences that may not be fully realized for generations.

Genetic sequelae are not immediately evident in most cases, but embryonic or fetal x-irradiation results in immediate deficiencies, particularly in the central nervous system. Since the range of human "normality" is so great, both with respect to malignancy and intelligence, small decrements following low level irradiation would be difficult to determine. However, the general linearity of effect suggests that x-irradiating the embryo, particularly in the early stages, will result in deficiencies among survivors. In later stages there is a two-fold hazard when the fetus develops its own germ cells, the precursors of its entire hereditary line.

The justification for such a discussion as this lies not in the fact that there are over 5,000 practicing radiologists in this country,

fully informed and qualified in their specialty, but that there are also 125,000 or more non-radiologists who have it within their power to x-irradiate ovaries, testes, or embryos for one reason or another. Radiology is indispensable to modern medical practice, but there is no justification for the exposure of either gonads (of those of reproductive age) or embryos, short of saving the life of the adult. While we cannot experiment with or investigate the effects of ionizing radiations on the human gonads or embryo, until we do have more direct information it should be assumed that the human is biologically like all other mammals and that caution should be exercised in favor of future generations. Otherwise ill-advised use of radiations will add to the inevitable cosmic and natural exposures, and increase the deficiencies and debilities of the human stock. This need not happen.

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The Dentist and the Space Age*

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WHEN the atomic powered submarine became a reality several years ago there was thrust upon the scientific world a "space ship for inner space." The true submersible and the sealed space ship have in common a condition of prolonged confinement which presents formidable problems of environmental medicine. One of the fundamental problems facing workers in both fields is the lack of knowledge concerning the extent to which man is dependent upon the natural composition of the earth's atmosphere. The submarine is affording us an excellent opportunity to solve some of these problems before putting a man into space.

The advent of the International Geophysical Year, with the decision of many nations to maintain bases in Antarctica, presented a second opportunity to study phases of environmental stresses. These stresses were related particularly to prolonged isolation, lack of communication, changes in diurnal cycles, confinement of small groups of men for many months, food preservation and diet, in addition to severe cold.

For the past five years, dental and associated problems of the true submersible have been under study by the dental profession and, for the past three years, dentists have "wintered over" at bases in Antarctica. Information gathered from these two sources is being analyzed extensively. It is hoped that knowledge gathered from these sources will help solve some of the problems of space travel and living.

PROBLEMS OF LIFE IN A CLOSED ENVIRONMENT

The harnessing of atomic energy and its

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utilization as a unit of submarine propulsion was a spectacular engineering development. The secrecy surrounding the development of the atomic bomb and the rapidity of the development of a workable atomic engine resulted in the building of a true submersible but presented problems in physiology and biology which could not be readily answered. Scientists in these fields did not know what tolerance limits or time-concentration ratios of atmospheric contaminants man could withstand.

In the closed environment of this under-seas space ship, things that were never considered problems now became problems of the first magnitude. Every day household items presented atmospheric contaminants which, potentially, could reach toxic levels. Shoe polish, paint, paint thinners, mercury on mirrors and in thermometers, insect sprays, benzine in lighter fluids, acrolein from the fat in cooking, Freon from air conditioning systems, shaving soaps, smoking, with its production of carbon monoxide, and even breathing, with carbon dioxide as an excretory product, became potential sources of trouble. Still other problems that required study were the effects on the physiology of high CO₂, low O₂, variations in pressure, nitrogen, ozone, trace substances, heat and cold, radiation, prolonged confinement, changes in diurnal cycles and diet. In addition, there are these problems peculiar to the space vehicle itself—the gravity free state, acceleration and sensory deprivation. This, of course, is but a partial list of known sources of problems. Every attempt is being made to anticipate further potential sources and time alone will tell how thorough is our reasoning.

DENTISTRY'S ROLE IN SOLUTION OF PROBLEMS

The dental profession has a dual role in the search for answers to the problems of life in an unnatural environment. It first must solve

and answer those problems that are specific to the oral structures but, secondly, it can and must assist the physiologist and biologist using the oral structures as a tool for diagnosis.

In the work already accomplished in the study of the effect of the stresses of an unnatural environment on oral health, a foundation has been laid, by working with submarine and Antarctic personnel, to satisfy dentistry's dual role. Work already completed can be briefly summarized.

Submarine personnel

1. Cariogenic rates. An 18 month study was made to compare cariogenic rates of men in submarines with men living either on surface craft or ashore. The men living for the most part in a closed environment, as compared with the control group, showed almost 100% increase in cariogenicity as determined by the DMF Index. The mean ratios showed an increased DMF (teeth) of 1.28 in the control group as compared with 2.46 in the experimental group over the 18 month period. When tooth surfaces (DMF-Surface) were compared there was an increase of 5.76 surfaces in the control group and 8.29 in the experimental group.

2. Soft tissue health. Gingivitis as expressed by the PMA Index was also studied in these same two groups over the 18 month period. Once again the men in submarines showed an alarming increase of gingival inflammatory conditions. When the PMA Index was used, taking into consideration only the areas involved (PMA-A) and not changes in the severity of the inflammatory conditions, the mean change in the control group was +1.36 areas; the experimental group showed an increase of +6.25 areas. If the severity of the inflammatory conditions was noted the differences between the two groups was even greater. Expressing severity as PMA-T, the control group mean increase was 2.28 while the experimental group was +7.83.

3. Atmospheric contaminants. Oral detection of mucous membrane changes due to atmospheric contaminants is a dental re-

sponsibility. In a recent cruise of an atomic powered submarine, men began to complain of burning of the lips and oral mucous membranes. Alerting the atmospheric analysts, it was discovered that Freon had been escaping into the vessel from the air conditioning system. The amount of Freon in the air, however, was still below what was considered tolerance limits for personnel. Available literature at the time stated that the potential danger of Freon was its breakdown and formation of phosgene at high temperatures. The heat necessary for this process was attained only through such things as a welding torch which, of course, would not be used in a submerged submarine. Further research into Freon's chemistry, however, showed that at much lower temperatures (300-500°F.) Freon breaks down into the gases hydrogen fluoride and hydrogen chloride. Dissolution of these gases in the moisture of the mucous membranes produced strong acids causing mucous membrane irritation. This knowledge led to the eventual welding of all joints in air conditioning systems to prevent Freon escape.

4. Aids to physiological problems. Dentistry has also assisted the physiologists. Through the use of the information given to us by Dr. Schour of the University of Illinois concerning the growth and calcification of the rat incisor and by the microcalcium technics perfected by Dr. Munson of Harvard Dental School, we were able to show that carbon dioxide acts as a stimulant to the parathyroid gland. Changes were illustrated in the metabolism of serum calcium and phosphorus and histologic changes were shown to occur in the calcifying tooth structure.

In the course of these studies on calcification, an interesting observation was made on animals that had lived for varying lengths of time in an atmosphere enriched with CO₂ and then allowed to recover on room air. The recovery period was accompanied by severe reactions of accommodation as indicated by the histologic changes occurring. These disturbances appeared more severe than anything seen associated with the contaminant phase of the experiment. It has led to a

new tangent of work to determine whether personnel exposed to an atmosphere containing an increased CO_2 content should be "degassed" in the same slow manner a diver is decompressed upon coming to the surface from the ocean depths.

Antarctic personnel

For the past three years, five dentists have "wintered over" in Antarctica. They have been collecting data not only on problems that are strictly dental but have gathered a wealth of material to assist the physician, physiologist, psychologist, bacteriologist and nutritionist. Only the first year's work has been completely analyzed. Results of the second year's study are partially completed but information on the third year will not be returned until next spring (1959).

1. Dental selection. The need for better methods of diagnosis of dental health prior to a prolonged isolated task was dramatically pointed out when even after careful selection prior to leaving the United States 89 of 92 men sought dental treatments during their 14 months on the ice. As the work became more tedious and the winter night progressed, as many as 51% of the men were under treatment at one time.

2. Toothaches and cold air. Toothaches due to rapid temperature changes ($+60^\circ\text{F}$. to -60°F .) were common. In most instances they were due to improperly placed fillings or improper preparation of teeth prior to arriving in Antarctica. Frequently, necks of teeth exposed by gingival recession were so sensitive to the cold that cavities were prepared and filled with an insulating cement.

3. "Dry Socket." Alveolar osteitis was a problem. Lack of post-operative healing occurred in over 22% of extractions in the first year. During the second year of study of this problem, men were retained in sick bay and not allowed to venture into the cold for 24 hours. This reduced the incidence of alveolar osteitis to 4%. This was still considerably over the 0.9% as reported to be the national incidence by The University of Pittsburgh School of Dentistry. Healing of other wounds was also somewhat retarded. We now

believe that this high percentage of alveolar osteitis is due to basic changes in the blood clotting mechanism as a result of cold acclimatization rather than bacterial invasion. A complete hematologic study of this problem is underway at present.

4. Viral and bacterial infection. Bacterial infections offer practically no problems. There appears to be an attenuation of bacteria due to the cold in addition to the development of an immunity to each other of the persons within the group. Colds and infections of bacterial origin become almost non-existent after 4-5 months of isolation but reoccur in most violent proportions upon the return of "outside" personnel to the isolated group.

One item of importance from the oral standpoint is that even though bacterial infections seem to cease and the virus of upper respiratory infections is inactive, oral mucous membrane ulcers occur with increasing severity as the period of isolation increases. The organism has not been isolated but the question arises as to whether there would be developed a strain of virus through inbreeding and self-inoculation more virulent than anything we now know.

5. Bacterial activity. Cariogenic activity has not been entirely assessed. It is known, though, that when personnel are exposed to severe low temperatures the acid producing potential of oral bacteria decreases. This was determined by measuring acid production rates in dental plaques after carbohydrate rinses when working outdoors at temperatures as low as -57°F . The numbers of oral lactobacillae also decrease during these cold work periods, probably through depression of bacterial activity and salivary dilution.

6. Vitamin tolerance. Diet and dietary supplementation are important factors to the dentist in maintaining oral health. In submarines, Antarctica or space vehicles, food, its preservation, preparation and consumption are items of prime importance. Loss of vitamin content could cause serious general as well as dental disorders. A series of vitamin tolerance tests were performed measuring the B-complex and C vitamins accurately to de-

termine an individual's need in terms of vitamin supplementation during long periods of isolation without fresh provisions.

7. Non-specific stresses. Since World War II, psychosomatics in dentistry has played an ever increasing role in diagnosis. It has been suggested that various oral soft tissue lesions now occur through lowering of tissue resistance brought about by disturbances in one's equanimity. To help analyze effects of prolonged isolation, severe cold, six months of night followed by six months of daylight, and close habitability with the same group of men had on oral health, a "Health Questionnaire" was prepared with the cooperation of psychologists. It was completed by the men monthly as part of a routine dental examination. They were questioned in nine broad fields ranging from questions almost purely psychological to those strictly dental. Since this test was administered as an adjunct to dental treatment and since it was filled out by the men without resistance, the opinion has been given by a prominent psychiatrist interested in problems of isolated living, that these responses may be the only valid measure from which psychological interpretations can be made over the past two years for men living in Antarctica.

Through 350,000 responses given to 68 questions on man's reaction to the stresses of prolonged confinement in an unnatural environment, where six months of darkness follows six months of light, we hope to better our knowledge of man's reaction to the total darkness of outer or inner space.

DENTISTRY'S CONTINUING CONTRIBUTION

Information gathered from submarines and from Antarctica is still being processed. However, problems already known must be solved. To this end, several associated experiments are underway. In an attempt to explain the increased cariogenic rates of men living in the closed environment of a submarine, the rate of caries formation is being studied using but one of the probable exciting causes at a time. Carbon dioxide, increased noise levels, loss of periods of light and dark

are being studied as forerunners of cariogenic activity.

In like manner these probable exciting causes are being studied to determine what effect they have on tissue resistance and tissue repair.

The work being done in Antarctica on changes in blood both from a biochemical and cellular standpoint, should be invaluable in determining what effect living in an unnatural environment has on man.

WHAT ARE THE PROBLEMS AS YET UNSTUDIED

1. Selection of personnel. Sir William Osler once said that the oral cavity was a mirror of the rest of the body. The condition of the teeth and soft tissues tells us more than the present state of a man's health. We should work closer to the psychologist in the selection of personnel for initial studies in space, since from the condition of these oral structures, we see man from six years of age to full maturity. Insights into the subject's tenacity of purpose, thoroughness of self-care, respect for physical fitness and probably fear of pain are all interpretations that can be extracted from a good oral examination.

2. Diagnosis. Better methods of diagnosis of pulpal and periodontal health are also necessary. The gross methods presently used of assessing dental health are entirely inadequate for long periods of time in an enclosed environment. We must be able to more accurately diagnose sub-clinical changes in the pulp and periodontium that may cause trouble under stress. In recent studies we have discovered that such small things as changes in environmental pressure may cause acute exacerbation of conditions that could not be diagnosed under presently available methods and technics. In one instance an operating submarine had to withdraw from exercises because of a toothache resulting from a rapid change in pressure. A complete dental examination made on the subject shortly before this incident had not revealed the potential source of pathology.

3. Dental treatment. Operative dentistry must also undergo critical analysis. Preparation of cavities must be accomplished without excess heat and vibration which might lead to pulpal destruction under increased gravitational stress. Filling material must be carefully manipulated or better ones manufactured to withstand invasion of cold, pressure changes, or traumatic stresses. What

may seem quite adequate for normal living is not good enough for the Space Age.

Periodontal health must be maintained. It is entirely probable that space travel will involve capsule meals where teeth are unnecessary. Education and instruction of space personnel are essential to prevent periodontal or temporomandibular trouble through prolonged exposure to excessive cold.



SENIOR SCIENTIST COUNCIL OF NAVY LABORATORIES

(Taken at meeting at National Naval Medical Center,
Bethesda, Maryland, March 16, 1959)



U. S. Navy Photo

(L to R—bottom row) G. J. Dashefsky, R. H. Lyddane, T. J. Killian, Capt. O. E. Van Der Aue, MC, USN (Commanding Officer, Naval Medical Research Institute), R. S. Muckenfuss, G. K. Hartmann, A. B. Focks, D. A. Wilson.

(L to R—2nd row) H. T. Karsner, O. M. Owsley, W. A. Key, R. E. Schoenherer, E. M. MacCutcheon, C. H. Barry, I. Eastermann, C. E. Menneken.

(L to R—3rd row) F. A. Rohrman, W. B. McLean, W. R. Miles, R. M. Page, J. E. Henderson, E. P. Cooper, H. C. Weber, J. V. Charyk.

(L to R—top row) R. V. Alfred, F. S. Atchison, L. M. McKenzie, E. S. Lamar, J. F. Bodenberg, H. Waterman, H. V. Nutt, O. W. Helm.

The Veterinarians' Part in Air Force Space Research*

By

LIEUTENANT COLONEL A. TAYLOR, USAF(VC)†

(With three illustrations)

TODAY, seventeen Air Force Veterinary Corps officers in the Air Research and Development Command are engaged in scientific research and development. I should like to discuss the contributions of these men. In addition to these officers, veterinarians at the School of Aviation Medicine and the Arctic Aeromedical Laboratory perform research and development. A number of Air Force Veterinary officers also work in research and development in joint service institutions such as the Naval Radiological Laboratory, the Armed Forces Institute of Pathology, the Walter Reed Army Institute of Research, the Oak Ridge Institute of Nuclear Studies, and at several Atomic Energy Commission installations. Of 300 veterinary officers in the U. S. Air Force, approximately forty support biomedical research and development.

Why is there a demand for veterinarians in research and development? The answer is that the knowledge of the veterinarian—particularly of the anatomy, physiology, and pathology of animals—helps to assure success in research. The veterinarian can contribute to research and development in two ways. First, the health of animals is of prime necessity if research is to be successful. The veterinarian can skillfully prepare animals for research procedures. Being familiar with various species, he can aid in their restraint, using anesthesia when necessary. He also can provide on-the-spot clinical observation of the reactions of animals and necropsy examinations to supplement clinical observations. In addition to these contributions, he is a valuable assistant to the

medical investigator in the planning of all research which uses animals. The second reason is that during his six years of collegiate education, a veterinarian receives an understanding of a wide variety of biological disciplines, including anatomy, physiology, histology, chemistry, bacteriology, pharmacology, medicine, and food hygiene. This wide basic knowledge aids him in acting as a primary investigator in many aspects of the Air Force's biomedical research and development program. A little later we shall see what kinds of investigations are being conducted.

I have personally observed erratic and misleading conclusions drawn from research studies primarily because investigators failed to recognize that their animal subjects were ill. In the Air Force, animal services are designed to supply healthy animals for scientific investigations. To support research which utilizes animals, each of the Air Force's aeromedical laboratories maintains a vivarium which houses research subjects—monkeys, dogs, cats, rabbits, guinea pigs, hogs, hamsters, rats, and mice. This support includes inspection and quarantine, proper housing, feeding, and care of the animals. When the animals arrive they immediately receive a complete physical examination. The methods and findings of physical examinations vary with different species. For example, the veterinarian must be on the alert to detect middle ear infections and avitaminosis-A in guinea pigs and ear mites in rabbits and cats. Deafness is common in Dalmatian dogs and albino cats, and would interfere with some experiments but not with others. Lung mites may be present in monkeys, and anemia is common in baby pigs. In addition, the veterinarian must be able to diagnose pregnancy in all species. During the 21-day quarantine period which follows, clinical and laboratory tests are performed to determine the effects of past illnesses. Blood and urine

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samples are analyzed. Skin tests and chest X-rays are made to detect tuberculosis, histoplasmosis, and other diseases. Intestinal parasite infestations are diagnosed on the basis of fecal examinations and the proper treatment is prescribed.¹

A research project scientist may require preparatory surgery on an animal for a particular experimental procedure. This is accomplished in a modern operating room under complete anesthesia and asepsis. Preparation for experimentation includes such routine matters as selection, clipping, and administration of anesthesia; and also often complicated surgical preparations such as the placement of electrodes in specific areas of the brain to measure oxygen potentials. Catheters may have to be placed in any of the heart chambers or major blood vessels to obtain changes or differences in pressure or oxygen saturation. A carotid loop may be constructed to bring the carotid artery outside the neck—a procedure useful in facilitating the removal of arterial blood and in obtaining rapid blood pressure measurements.² These are a few of the surgical procedures to prepare animals as living laboratory instruments useful to our scientists.

To place proper importance upon the laboratory animal, it should be considered in the same light as any other tool or reagent used in research. It must be as carefully controlled and as painstakingly calibrated and standardized as the most sensitive instrument. It also is important to realize that, being a living organism, this research tool must receive expert care seven days a week.³ The quality of research results is directly related to the quality of the animals used in research procedures.⁴

Whenever animals are used in research, experiments are monitored by a veterinarian who offers appropriate aid and advice; and assures that humane care, procedures, and practices are followed in accordance with the "Rules Regarding Animal Care" as established by the American Medical Association. He also frequently assists the medical investigator and observes the clinical effects of the experiment. This is the work of our Air



U. S. Air Force Photo

FIG. 1. Pressure Suit and Oxygen Helmet for a Dog. Pressure suits must be worn by animals including man for protection at altitudes above about 40,000 feet. This dog is ready to go in an altitude chamber where he will be exposed to an explosive decompression which simulates what happens when a canopy of a pressurized aircraft blows off at high altitudes. Results of this work have already contributed to the saving of lives of aircrews.

Force veterinarians which I have classified under the heading of animal services. Four officers are assigned to animal services in the Air Research and Development Command.

Another closely related category of work is pathology. Not only is it important that clinically healthy animals be used for experimental procedures, but also that clinical findings be confirmed by appropriate postmortem examinations since clinically normal animals may have abnormalities which cause them to react in an unusual manner. At each of the Air Force aeromedical laboratories, veterinary pathologists perform necropsy examinations on all animals that die. Reports of the gross and histopathological findings are submitted to the medical investigator. These men also advise medical investigators of the relative significance of their findings as related to the research being done. One of these men has been certified by the American College of Veterinary Pathologists and another is eligible for certification. Postmortem examinations are a means of assuring that the biological laboratory instrument used was properly calibrated and reacted in the usual way.



U. S. Air Force Photo

FIG. 2. Mouse and Life Support Capsule prepared for Missile Flight. This capsule, in which a mouse has flown in space, contains provisions to supply oxygen, food, and water, and instrumentation for the transmission of data to monitor vital life functions.

A pathologist also assists in planning the experimental design in research programs when animals are used and provides consultation for animal clinicians in disease and parasite control.

It appears that an opportunity will be afforded our scientific teams to send biological packages of various sizes on several types of space or near-space vehicles. These packages probably will be suitable for several different species and will fly for varying lengths of time. It therefore will be necessary to develop lower mammal and small and large primate chairs, restraints, feeding facilities, capsule sanitation, and instrumentation arrangements. A mouse has already flown in space aboard a ballistic missile. Preparation includes instrumentation. Food and water is provided in liquid form and provision is made for a supply of oxygen and absorption of carbon dioxide. The assembly is then placed in an air-tight capsule.

Animals will precede man in space to vali-

date experimental findings before we are willing to risk human life. The prediction of human effects and capabilities depends upon careful extrapolation from painstakingly designed and observed animal experiments. Since animals differ in the degree to which they resemble human beings with respect to various functions, and because equal weight-bulk allotments will not always be available, animals of several different species will have to be used in these space biology studies. Many of these can be useful in different experiments, provided particular animal capabilities and characteristics are carefully selected and a background of experience with these animals, if not already available, is built up. Thus, a maximum amount of medical information may be obtained to result in medical benefits to mankind. When animals fly in satellites, our scientists will study the effects of cosmic radiation and weightlessness and test the effectiveness of environmental control equipment.

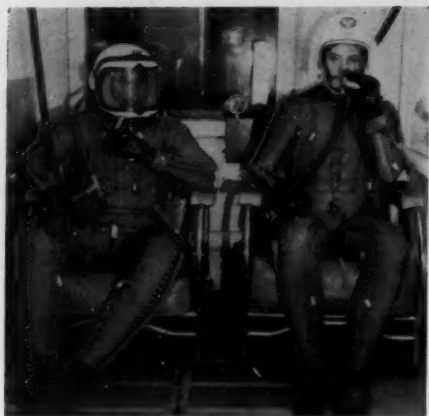
Next are five categories of research and development activities—biophysics, bio-acoustics, biochemistry, flight feeding, and radiobiology. In these areas Veterinary Corps officers in ARDC act as project and task scientists in research and development. They are members of research teams composed of scientists of varied backgrounds using an inter-disciplinary approach to the solution of Air Force problems. Let me stress this point—these are not veterinary research and development projects. They are biomedical research projects of the Air Force aimed toward furthering the protection and safety of our aircrews on the ground, during flight through the earth's atmosphere, and in space. Veterinary officers only support and participate in this medical research and development.

Now let us look at some of this work in detail. Veterinarians are assigned as Chief of the Acceleration Section in the Biophysics Branch of the Aeromedical Laboratory and as Chief of the Biosatellite Operations Branch of the Aero Medical Field Laboratory where they serve as primary investigators of acceleration in flight. Animals play

an important role in this phase, particularly those experiments involving the use of the large centrifuge and high speed rocket sleds to determine the effects of gravitational stresses. Animals are used to measure physiological responses which cannot be measured in humans. Studies of this basic physiology of flight at ground level include those on the heart, kidney, water metabolism, and the regulation of total body fluid volume.¹ Here—and this applies generally to a large percentage of biomedical research—new procedures are first worked out using instruments; next the procedures are applied to animals, and finally to man.

For example, one of the Air Force problems might be—can man withstand the g-forces of riding a certain missile into space and back? This question can be answered by first finding out how much g-force will be applied, how rapidly, and for how long it will be applied. Available knowledge might permit an immediate decision that the forces are within human tolerances, or alternatively, that they are far beyond human endurance. On the other hand, the g-forces might be within that questionable zone somewhat beyond what man is already known to be able to withstand, yet not so far beyond that it is known he will be damaged. In such a case, using instruments for measurement, these g-forces can be reproduced on a centrifuge in a programmed sequence to duplicate the g-forces produced in a missile. Next, animals would be exposed on the centrifuge and their reactions observed. Provided findings were favorable, Air Force human volunteers would finally ride the centrifuge to demonstrate the applicability to man and to permit further observations by our scientists. Thus, animals are a vital link in the chain of space biology studies which prepare our aircrews for flight in the vehicles of the future. Instrumented animals, used in experiments, are routinely anesthetized during experimentation.

Another veterinarian in the Bio-acoustics Branch of the Aeromedical Laboratory is concerned with neuropathology on animals exposed to noise and vibration. As most of



U. S. Air Force Photo

FIG. 3. Veterinary officers dressed in pressure suits seated in altitude chamber. The one on the left is eating food sticks inserted through his helmet using an experimental device similar to a lady's lipstick. The man on the right is wearing another type of helmet. He is eating a prototype semi-solid food from a squeeze tube passed through a trap door in the helmet.

you probably realize, high intensity sound can damage and actually kill man. Consequently, the Air Force is very much interested in finding methods of protecting living tissue, and hence man from the noise and vibration produced by high performance aircraft and missiles.

The Aeromedical Laboratory is charged with the task of developing food and food packets for use during flight, and for survival in case of emergency landings or crashes in isolated areas. The laboratory has found it can efficiently utilize veterinary officers in this part of its mission because of the training they have received in food and dairy technology, bacteriology, nutritional physiology, public health, and environmental health. Veterinary officers with graduate training have been assigned to nutrition activities for many years. They work with scientists in allied disciplines which include physiologists, nutritionists, and food technologists. Three veterinary officers are assigned to this work at present. One acts as Air Force Liaison Officer at the Quartermaster Food and Container Institute for the

Armed Forces in Chicago. He informs the Institute of specific Air Force programs relating to flight and survival, and advises the food technologists on the satisfactory solution of Air Force problems. He is required to participate at many technical conferences and scientific meetings pertaining to the development and packaging of foods to satisfy Air Force requirements.¹ Another is assigned as an assistant project scientist. He supervises activities in the formulation and design of experiments performed. He coordinates the work accomplished by three sub-tasks which include nutritional physiology, development of flight and survival food and food packets, and development of feeding methods useful in new flight vehicles. After development of food items by the Quartermaster Food and Container Institute for the Armed Forces, they are tested under simulated operational conditions in the laboratory to determine their utility and acceptability.¹

Another member has for the past three years assisted in nutritional physiology research. He helped monitor a research contract study for the development of bases for an all-purpose, all-climatic, global survival ration and served as a liaison officer to the contractor, the University of Illinois. He was responsible for feeding and providing equipment for 100 human test subjects and for the expensive items of laboratory equipment. He later conducted studies on animals to determine the causes and means of relief of gas pains in aircrews at high altitudes; and in equating the relationship of water deprivation, diet regime, and heat-work stress by means of hormone assays in laboratory animals. Still later he engaged in a study to determine water and electrolyte requirements of airmen subjected to extreme altitudes, thermal stress, pressure suits, and oxygen masks.¹ This officer, in addition to being a Doctor of Veterinary Medicine, has a master's degree in animal nutrition. He is now at the University of Wisconsin working toward a Ph.D. degree.

A major problem of flight in space for very long periods of time will be that of providing a completely balanced ecological sys-

tem suitable for human occupancy for prolonged periods of time. The most difficult part of this system will be the reconstitution of wastes into materials of caloric value to the body. Our Air Force veterinarians are now beginning to work with members of many other disciplines in the solution to this problem.

A veterinarian who has graduate training in radiobiology is stationed at the Air Force Special Weapons Center in Albuquerque, New Mexico. His work concerns the hazards of nuclear weapons, nuclear powered flight vehicles, and reactors, including the effects of possible accidental crashes of aircraft carrying nuclear weapons. Here the danger is primarily from a high explosive with an additional radiation hazard from plutonium. This has been determined from tests using animals in the area where a weapon explodes without a nuclear yield. The team of scientists with which this man works is now monitoring contract studies of the inhalation hazards and inhalation metabolism of plutonium.

Two other officers with graduate training in radiobiology are stationed at the Aero Medical Field Laboratory doing work on the hazard to man of ambient space radiations. Animals have been flown in balloon gondolas at altitudes in excess of 100,000 feet and monitored with detection devices to determine the effects of cosmic radiation. Information obtained from Explorer IV, one of the earth satellites, and from Pioneer, the moon rocket, has emphasized the need for more data on the hazard to man from cosmic radiation. Although the extent and seriousness of cosmic radiation hazard await further exploration and verification, it can be assumed that the duration factor eventually will make any level of exposure questionable. It will therefore be necessary, whether intensities turn out to be high or low, to provide for radiation detection and identification, and to extrapolate animal experimental data.

There is one more officer shown in Table I under the category of Administration and Management. This is the author who is assigned as Deputy Chief, Biomedical Division, Directorate of Life Sciences, Hq Air Re-

TABLE I
LIFE SCIENCES RESEARCH AND DEVELOPMENT
VETERINARY CORPS OFFICERS IN THE AIR
RESEARCH AND DEVELOPMENT COMMAND

Type of Work	Number of Officers
Animal Services	4
Pathology	2
Biophysics	2
Bio-acoustics	1
Biochemistry	1
Flight Feeding	3
Radiobiology	3
Administration and Management	1
Total	17

search and Development Command. In addition to contributing to the overall planning, organizing, and management of the biomedical research and development program of the Air Force, this officer also provides special guidance in the administrative aspects of animal experimentation, food research and development, and the placement, use, and guidance of veterinary officers throughout the command.

You have noted that most of these Veterinary Corps officers have additional educational training—that is, graduate education in some specialized field. This is in addition to six years of college education required of a Doctor of Veterinary Medicine. Because of the wide background of biological knowledge gained during his education, a veterinarian can quickly assimilate training in many related disciplines. In the Air Force as a whole a few Veterinary Corps officers have the Ph.D. degree, and a number have the masters degree. In addition, there are several officers who have completed extended in-service training. These specialty areas include radiation biology, virology, pathology, and tissue culture, comparative pathology, physiology, parasitology, laboratory animal techniques, food technology and nutrition, and

food laboratory and veterinary laboratory analysis.

Such training is needed for participation as members of specialized research teams in the solution of highly technical problems involved with flight of the future. Let me urge that the young veterinarian who wishes to do research prepare himself to the maximum extent. A master's degree in the field in which he wishes to work will be a great aid not only in planning and executing his studies to obtain accurate and definitive results with a minimum expenditure of time, effort, and funds; but it is also an aid in having his work accepted by his colleagues since he is recognized as one who possesses the knowledge to grasp and deal with problems in his specialized field. A doctor of philosophy degree with concentration in his chosen field makes him a rare individual. His ability in research and development is greatly multiplied and the acceptance of his findings by his colleagues is increased accordingly so that the results of his work quickly find their way into usage.

In closing I wish to leave the thought with you that the U. S. Air Force Veterinary officer has been a valuable assistant in biomedical research endeavors and is ready to further assist in any way the Surgeon General desires.

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Studies on the Host Parasite Relationships to *Schistosoma Japonicum*: III*

The use of purified antigens in the diagnosis of infections in humans and experimental animals

By

E. H. SADUN, Sc.D., S. S. LIN, M.D., AND B. C. WALTON, Ph.D.

DIAGNOSIS of schistosomiasis through the recovery of eggs is very difficult and often impossible. In chronic schistosomiasis, in early acute infections, and in those cases which are mild, latent or therapeutically affected, a negative determination for eggs is inconclusive.

Because of these considerations, many investigators have attempted to develop immunological tests for the laboratory diagnosis of schistosomiasis. Intradermal tests have been used with promising results (Fairley and Williams, 1927; Manson-Bahr, 1929; Taliaferro and Taliaferro, 1931; Vogel, 1932; Khalil and Hassan, 1932; Hassan and Betashe, 1934; Kan, 1936; Culbertson and Rose, 1942; Oliver-Gonzales and Pratt, 1944; Wright *et al.*, 1947; Mayer and Pifano, 1949; Coutinho, 1949, 1952; Okabe and Yamaguchi, 1952a, 1952b, 1954; Pesigan *et al.*, 1951, 1954; Sawada *et al.*, 1954; Sherif, 1956; Pellegrino *et al.*, 1957; Hunter *et al.*, 1958). Most stages of the life cycle of the parasite have been used as sources of antigens. Some workers have claimed greater sensitivity with alcoholic extracts, others with saline extracts, and many have commented on the relatively low degree of specificity.

Since the time when Yoshimoto (1910) demonstrated the possibility of using complement fixation tests for schistosomiasis, several attempts have been made by various investigators to develop serological tests for the laboratory diagnosis of this disease and for an evaluation of the efficacy of therapy

(Fairley, 1919; Mayiji and Imai, 1928; Taliaferro *et al.*, 1928; Hoeppli, 1921; Les Bas, 1922; Fairley, 1925; Andrews, 1935; Salam, 1935; Oliver-Gonzales and Pratt, 1944; Mayer and Pifano, 1945; Brandt and Finch, 1946; Wright *et al.*, 1947; Williams, 1947; Okabe and Yamaguchi, 1954; Chaffee *et al.*, 1954; Horstman *et al.*, 1954; Eliakim and Davies, 1954; Oliver-Gonzales *et al.*, 1955; Kagan and Oliver-Gonzales, 1956). With the exception of Schneider *et al.*, 1956, 1957, relatively crude extracts of cercariae or of adult worms were used and cross reactions were reported.

In view of the encouraging results which were obtained with the use of purified antigens in the immunodiagnosis of paragonimiasis (Sadun *et al.*, 1958, 1959), attempts were carried out in the present study to prepare purified *S. japonicum* antigens and to evaluate them in the intradermal and complement fixation tests for the immuno-diagnosis of schistosomiasis japonica. Preliminary findings were reported previously (Sadun, 1957; Sadun *et al.*, 1958a) in abstract form.

MATERIALS AND METHODS

Antigens for intradermal and complement fixation tests were prepared from adult *S. japonicum* obtained from rabbits experimentally infected with between 500 and 800 cercariae each, 2 months previously. Cercariae were obtained by crushing infected snails collected from endemic areas. The animals were infected as described elsewhere (Sadun and Walton, 1958). Five antigens were prepared from the adult worms: a relatively crude fat-free antigen (SC), a lipid-free borate buffer extraction (STP), an acid soluble protein fraction (SM), an acid in-

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soluble but alkaline soluble protein fraction (SM-ins), and an antigen containing metabolic products of the worms (S-ex). The fat-free antigen was prepared following essentially the technique described by Chaffee and his co-workers (1954) and the other three fractions of the adult worms were prepared according to the method described by Melcher (1943) for the preparation of purified *Trichinella spiralis* antigens. The metabolic antigen was obtained by incubating between 50 and 100 adult worms in a Carrel flask containing 5 ml of serum ultrafiltrate and 10 ml of Simm's X-6 solution, 15,000 units of penicillin and 15 mg of streptomycin. The mixture was incubated and the metabolic antigen collected as described by Sadun and Norman (1957) for *Trichinella spiralis*. Protein determinations, standardization of the antigens, complement fixation, and intradermal tests were carried out as described previously (Sadun *et al.*, 1959).

Preliminary intradermal tests conducted in individuals examined at regular intervals from 5 minutes to 48 hours indicated that all positive reactions were of the immediate type and reached their peak at about 20 minutes. At this time, the limits of each wheal were outlined with a ball point pen and transferred to paper. The areas were later measured with a planimeter. The test was read as positive when the area of the antigenic wheal was at least twice that of the control wheal if 70 mm² or more, or at least three times that of the control wheal if less than 70 mm². The control reactions were considered as giving false positives if producing wheals of more than 85 mm² regardless of how much larger the antigenic wheals were. The presence and intensity of erythema were not employed as criteria in reading the results.

Individuals from endemic areas in Yamaguchi Prefecture, Japan, and in Leyte, the Philippine Islands, were subjected to the intradermal tests. In addition to *S. japonicum*, most of these patients also harbored various intestinal helminths and protozoa. Persons from non-endemic areas who were negative for *S. japonicum* by examination of stools were used as negative controls. In-

dividuals with clonorchiasis or paragonimiasis from Korea who had never lived in areas endemic for schistosomiasis were selected for studying the extent of cross-reactivity of the intradermal test.

Sera for the complement fixation test came from proven schistosomiasis patients and from trematode-free controls. In order to evaluate the degree of specificity of the reaction, sera from individuals with proven paragonimiasis, clonorchiasis, tuberculosis, histoplasmosis, coccidioidomycosis, syphilis and leprosy were tested.

Sera from 48 rabbits were used to study the development of antibodies in experimentally infected animals. The rabbits were given a single dose of between 500 and 800 cercariae and bled just before exposing them to the cercariae and at various intervals thereafter. At the end of each experiment, all of the animals were sacrificed by exsanguination and examined for the presence of *S. japonicum* adults. Seven rabbits were also inoculated intramuscularly with varied amounts of antigenic material (SM, SC and S-ex) adsorbed onto aluminum hydroxide (Dorin, 1946). Uninfected rabbits were bled from time to time as source of negative control serum.

RESULTS

Intradermal Tests. An experiment was designed to compare the reactions produced by three fractions of the adult worms. As indicated in Table 1, among the infected individuals, best results were obtained with SM antigens. Not only was the per cent of positives greater in this group than in the others, but the wheals produced by the antigen in infected individuals were larger and more distinct than those produced by the other antigens. None of the uninfected individuals gave positive reactions to any of the three antigens employed. Because of these results, the acid soluble protein fraction of *S. japonicum* (SM) was used throughout the rest of the experiments together with the saline control (BSM).

In the second experiment, the cutaneous reactions to this antigen in persons with proven schistosomiasis were compared with

TABLE 1

CUTANEOUS REACTIONS TO VARIOUS *S. Japonicum* ANTIGENS IN INFECTED AND NON-INFECTED INDIVIDUALS

Test solution	Infected individuals				Non-infected individuals		
	Number tested	Positive reactions	Per cent positive	Mean size of wheal in mm ²	Number tested	Positive reactions	Mean size of wheal in mm ²
SC	128	122	95	118	6	0	50
SM	179	177	99	169	27	0	53
SM-ins	128	126	98	139	6	0	50
BSM (control)	179	0	0	41	27	0	42

the reactions to the same antigen in persons with other trematode infections. As indicated in Table 2, a certain degree of cross reaction occurred with paragonimiasis and clonorchiasis patients. However, the wheal produced by the homologous antigen was always much larger and more distinct.

An analysis of the degree of reaction in relation to age and sex was carried out in 166 persons with proven schistosomiasis. In both sexes, the mean size of the wheals increased with age (Figure 1). No significant differences in response between males and females were observed.

To study further possible relationships between clinical schistosomiasis and the degree of intradermal reactions to SM antigen, 178 infected individuals were grouped according to the presence and duration of symptoms. As indicated in Figure 2, significantly larger wheals were observed in individuals with clinical symptoms than among those without complaints attributable to schistosomiasis. Also, the duration of symptoms appeared to have a direct relationship with the mean size of the wheals. Significantly larger wheals

were observed in the treated individuals than in those who had not been treated.

In view of the observed sensitivity of the intradermal test, another experiment was set up to study the correlation between the results of this test and of stool examinations. Two schools with a total of 696 children between 6 and 15 years of age in an endemic area in Yamanashi Prefecture were selected for this study. Two consecutive stool specimens were examined by the formalin ether concentration technique. As indicated in Table 3, all but 4 of the children in whom eggs were found, gave positive dermal reactions. On the other hand, in both schools there were many positive reactors in whom no eggs were found. In one-third of the *S. japonicum* positive stools, eggs were found only in the second specimen submitted.

The results of the first stool examination revealed that at least 79 per cent of the children harbored helminths and 18 per cent, protozoa. The prevalence, as determined by a single examination, was as follows: Helminths: *Trichuris trichiura*, 71 per cent; *Ascaris lumbricoides*, 28 per cent; *Trichostron-*

TABLE 2

CUTANEOUS REACTIONS TO A PURIFIED *S. Japonicum* ANTIGEN (SM) IN PERSONS WITH SCHISTOSOMIASIS, PARAGONIMIASIS, CLONORCHIASIS AND IN TREMATODE-FREE CONTROLS

Group	Trematode infection	Number of persons in group	Number of positives	Per cent of positives	Mean size of wheal in mm ²
I	<i>S. japonicum</i>	179	177	99	169
II	<i>P. westermani</i>	41	8	20	76
III	<i>C. sinensis</i>	26	2	8	64
IV	No trematodes	27	0	0	53

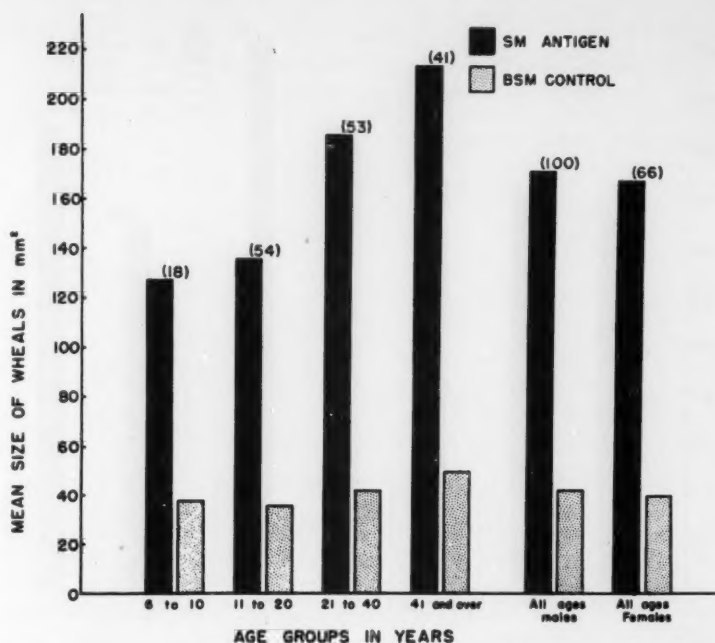


FIG. 1. Cutaneous reactions to a purified *S. Japonicum* antigen in 166 infected individuals according to age and sex. (Figures between parentheses indicate numbers of persons in various groups.)

gylus sp., 11 per cent; Hookworm, 9 per cent; *Schistosoma japonicum*, 9 per cent. Protozoa: *Endamoeba coli*, 11 per cent; *Endolimax nana*, 6 per cent, *Giardia lamblia*, 6 per cent; *Endamoeba histolytica*, 1 per cent; *Iodamoeba butschlii*, one person. Multiple infections were found in 64 per cent of the children examined.

TABLE 3

COMPARISON OF RESULTS OF INTRADERMAL TESTS AND TWO CONSECUTIVE STOOL EXAMINATIONS FOR *S. Japonicum* IN SCHOOL CHILDREN LIVING IN AN ENDEMIC AREA
(Figures between parentheses indicate the number of persons in whom eggs were found only after a second stool examination.)

School	Age in yrs	Egg exam.	Results of intradermal tests		
			Positive	Negative	Total
Primary	6 thru 11	Positive	29 (14)	2 (1)	31 (15)
		Negative	47	218	265
		Total	76	220	296
Jr High	12 thru 15	Positive	57 (14)	2 (1)	59 (15)
		Negative	136	205	341
		Total	193	207	400
Total	6 thru 15	Positive	86 (28)	4 (2)	90 (30)
		Negative	183	423	606
		Total	269	427	696

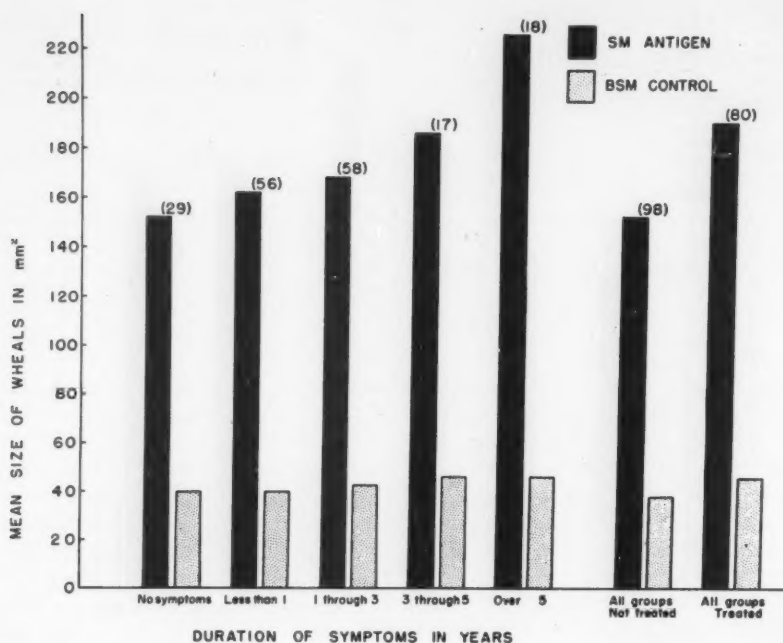


FIG. 2. Cutaneous reactions to a purified *S. Japonicum* antigen in 178 infected individuals, according to duration of symptoms and treatment. (Figures between parentheses indicate numbers of persons in various groups.)

Complement Fixation Tests. A preliminary experiment was set up to test various antigenic fractions of the adult worms in the complement fixation reaction. Box titrations for each of the four antigens were performed using human and rabbit antisera. SM and STP appeared to be more sensitive than SM-ins and S-ex. Because of these preliminary observations, SM was used throughout the following series of experiments and STP on a few selected sera.

Sera from 48 rabbits exposed to a single dose of cercariae were tested. All of the rabbits were bled before being exposed to the cercariae and a few bled at various times up to 6 months after infection. All of the animals gave negative complement fixation reaction before being exposed to the cercariae (Table 4). One rabbit became positive 15 days following infection and all of the three tested were positive 30 days following infection.

One rabbit remained negative until it was sacrificed 67 days after inoculation, although infection was confirmed at necropsy. The peak of the titer (1:128) was reached by most rabbits around 2 months following infection. The titer remained elevated without marked changes for the duration of the experiment. Sera obtained from 3 rabbits 180 days after infection were still positive at a titer of 1:128. Sera from uninfected rabbit controls gave consistently negative reactions.

Sera from 7 rabbits artificially immunized with SM, SC and S-ex gave positive reactions between 10 and 34 days following intradermal inoculation of the antigens. The highest titer (1:128) was reached in one rabbit receiving metabolic antigen (S-ex).

Sera from 68 individuals who had undergone treatment for schistosomiasis were tested by the complement fixation reaction using SM as antigen. Of these, 30 gave posi-

TABLE 4
RESULTS OF COMPLEMENT-FIXATION TESTS WITH A PURIFIED ANTIGEN IN
RABBITS EXPERIMENTALLY INFECTED WITH *S. Japonicum*

Length of infection (in days)	Number of sera tested	Number of positives	Complement-fixation titer (Reciprocal)						
			2	4	8	16	32	64	128
0	48	0	—	—	—	—	—	—	—
15	7	1	1	—	—	—	—	—	—
30	3	3	—	2	—	—	1	—	—
45	3	3	—	—	—	—	1	1	1
60	12	11	—	—	1	—	3	1	6
75	5	4	—	—	—	1	—	—	3
90	3	3	—	—	—	1	—	—	2
105	3	3	—	—	—	—	—	—	3
120	5	5	—	—	—	—	—	—	5
150	1	1	—	—	—	—	—	—	1
180	3	3	—	—	—	—	—	—	3

tive reactions. Since, at the time the sera were collected only a few stool examinations were performed, it is not possible to determine what percentage of these individuals were successfully treated. However, negative results were observed in three individuals in whom eggs were present in the stools at the time of bleeding. Sera from these three patients, as well as other sera from infected individuals undergoing treatment, were positive with STP antigen. As indicated in Table 5, no positive reactions were obtained from any of the Schistosome-free individuals with the exception of 1 leprosy patient, even though many of them gave positive reactions often with high titers with homologous antigens.

DISCUSSION

An intradermal test for schistosomiasis has a great appeal to workers in endemic areas because of its relative simplicity and rapid results. However, its usefulness in the past had been greatly restricted by the limited specificity and by the lack of objective standards of what constitutes a positive test. With these considerations in mind, an attempt was made to develop a purified antigen which could produce a test sufficiently sensitive and specific to be of practical value and which could be available in sufficient quantities for epidemiological surveys. In addition,

attempts were made to standardize the results on an objective basis. Since it is very impractical to obtain large amounts of antigens from cercariae, eggs or miracidia, all our studies were carried out with adult worms.

The antigenic materials were standardized in terms of protein content and consistently satisfactory results were obtained with 10 mg of protein per cent. In order to interpret the results of the cutaneous test on an objective basis, the area of the wheals developing at the site of inoculation after 15 minutes was calculated.

The intradermal test with an acid soluble

TABLE 5
RESULTS OF COMPLEMENT FIXATION TEST WITH
A PURIFIED *S. Japonicum* ANTIGEN (SM-INS)

Source of sera	Number of individuals	Number of positives	Per cent positives
Treated schistosomiasis	68	30	44
Trematode-free controls	18	0	0
Clonorchiasis	44	0	0
Paragonimiasis	58	0	0
Syphilis	22	0	0
Leprosy	12	1	8
Histoplasmosis	5	0	0
Tuberculosis	45	0	0
Coccidioidomycosis	5	0	0

protein fraction of the adult worms elicited only moderate cross reactions with related trematodes such as *Paragonimus* and *Clonorchis*. This may not be a serious obstacle in clinical practice, since these diseases are, as a rule, clinically distinct from each other and from schistosomiasis. In epidemiological surveys conducted where two or more of these parasites are endemic, it is possible to differentiate infections by introducing two or more antigens at the same time and by comparing the areas of the ensuing wheals.

Nearly all of the individuals with proven schistosomiasis gave positive intradermal reaction whereas no eggs were recovered from many of the reactors. In view of the very limited number of known false positive reactions observed in the preliminary controlled experiments, it is believed that the failure to recover eggs by stool examination rather than the lack of specificity of the intradermal test is primarily responsible for this apparent discrepancy. This belief is strengthened by the fact that in the course of our experiments, a second stool examination revealed many additional positives and by the consideration that the concentration technique used is relatively inefficient for *S. japonicum* eggs (Annual Prof. Report, 1954). These results are also in agreement with those of Hunter *et al.* (1958), who found that the number of positives by skin tests was markedly higher than by stool examinations. It is evident, however, that the intradermal test gave positive reactions even in those cases in which patients had recovered from the disease. In those instances, serological tests seemed to be necessary to differentiate between active and past infections.

The serological studies indicate that in rabbits, a complement fixation test using as antigen an acid soluble fraction of the adult worm is specific and sensitive. In humans, however, some individuals in whom eggs were present in the stools gave negative complement fixation reaction with the above antigen, although they were positive when a borate buffer extraction was used. The fact that no false positive reactions were observed

in infections with related trematodes and in those conditions such as tuberculosis, leprosy and syphilis previously reported to cross-react with crude antigens make this test quite useful for a differential diagnosis in doubtful cases. Attention is called to the fact that in our experimental animals, positive complement fixation reactions were observed 30 days following exposure to cercariae whereas stools become positive 40 to 50 days after infection. If confirmed and extended to human infections, these results indicate that the complement fixation test with this antigen may be very useful in early diagnosis of schistosomiasis before eggs appear in the stools, thus permitting the institution of treatment in the early stages of the disease. Preliminary investigations seems to suggest that the relatively cruder borate buffer extraction of the lipid-free worms might be more sensitive. Whether this increased sensitivity is obtained at the expense of specificity has not yet been determined.

SUMMARY

Five antigens were prepared from adult *Schistosoma japonicum* and tested for the immunodiagnosis of infections in humans and rabbits.

The intradermal test using an acid soluble protein fraction of the worms appeared to give consistently satisfactory results. Only moderate cross reactions with related trematode infections were observed. Among infected individuals, there was a gradual increase in the mean size of the ensuing wheals with age. No significant differences in the degree of cutaneous reactions were observed in the two sexes.

A complement fixation test using purified antigens was performed with sera from humans and experimentally infected rabbits. The test appeared to be very specific and in rabbits, at least, gave positive results in early infections before eggs could be detected in the stools.

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FLAG DAY, JUNE 14

"I pledge allegiance to the flag of the United States of America and to the Republic for which it stands, one nation under God, indivisible, with liberty and justice for all."

Divisional Helicopter Medical Evacuation Policies

By

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(With nine illustrations)

THE onset of the Korean conflict on 25 June 1950 presented many problems to the United States combat troops originally committed to the defense of the Republic of South Korea. Troop units were rapidly deployed from occupation duties in Japan, committed in small units and participated in the effort to maintain the defenses of the Pusan perimeter. Despite the fact that these units were not completely equipped nor manned, their defensive efforts were successful. The United States troops employed in that initial effort thus allowed an opportunity for United Nations combat elements entering the combat at later dates, to be filled to an approximation of Table of Organization and Equipment strength before they were employed in normal combat unit techniques. The replacements, however, tended to be "warm bodies" rather than qualified and trained replacements, and none of the troop units had an opportunity to develop more than a minimum of unit level training with these filler personnel prior to their engagement in the Inchon amphibious assault on 15 September 1950.

To add to the difficulties of employment of these recently filled, untested and relatively untrained units, an additional complicating factor was injected by the assignment of approximately 8,700 South Korean draftees,

The opinions expressed herein are personal, and are not to be construed as representing the official policies of The Department of Defense, The Department of the Army, nor of The Surgeon General of the Army.

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Photo: PIO 7th Inf Div

FIG. 1. Mass Disinfestation Techniques, 7th Infantry Division, Gotemba, Japan, August 1950.

who had been inducted only a matter of days before, into the Seventh U.S. Infantry Division, during its staging for the Inchon invasion. Language difficulties; differences in eating habits, including overeating of strange and unfamiliar American type foods resulted in the development of mass scale gastrointestinal upsets; differences in national sanitary standards and their implementation; practically universal infestation of incoming troops with *Pediculosis capitis* and *P. corporis* (see Figure 1 for Mass DDT Disinfestation technique); difficulty in procurement of required numbers of small sizes of U.S. issue clothing and equipment; inability to be fitted with or tolerate wearing of U.S. Armed Forces leather footgear; and a host of intestinal parasites—all of these factors tended to complicate the integration of these South Korean troops into the division. These problems were all solved, with varying de-

grees of success, but the major contribution to effective control, utilization and education of these South Korean soldiers serving with a United States Infantry Division resulted from the adoption of a "Buddy" system. This meant that when PFC Jones, for example, performed any military duty, whether it be answering roll call, appearing at pay table, eating, performing sentry duty, making a patrol, or assembling for a formation, he reported with his South Korean shadow. In a relatively short time, despite the major language barrier, by mimicry and example the United States soldier was able to have his "shadow" duplicate his actions. This personnel augmentation gave the division a firepower and combat potential actually in excess of that expected for a standard triangular United States Infantry Division.¹

The Seventh United States Infantry Division participated, with the United States First Marine Division, in the amphibious assault at Inchon, the capture of the capital city of Seoul and the engagement at Suwon (see Figure 2).^{1,5,8,9} Upon contact with the First U.S. Cavalry Division, which had pursued the enemy from the Pusan perimeter to the vicinity of Suwon, the Seventh Division was ordered out of combat to proceed to the port city of Pusan in preparation for a subsequent amphibious assault on the east coast of Korea. This second amphibious assault



Photo: Author

FIG. 2. Amphibious Tank (AMTRAC) used in casualty evacuation across the Han River during the assault on Seoul, Korea, September 1950.

extended from Wonsan to Iwon, with the 7th Division making an unopposed landing at Iwon on 29 October 1950. The 17th Infantry Regiment of the 7th Division rapidly advanced to the Manchurian border, to and past the border city of Hyesanjin. Other elements of the division comprised a Task Force that advanced to the east shore of the Chosin (Changjin) Reservoir, in support of a more westerly attack in conjunction with the U.S. 1st Marine Division. The difficulties of combat medical operations in the dead of winter upon the most inhospitable Korean-Manchurian plateau with a greatly extended division cannot be discussed in this paper. Wounded personnel were evacuated at times by locally procured sleds drawn by oxen, when ambulance jeeps could no longer be operated. Helicopters were not available for casualty evacuation at that time. The factors of extreme cold, prevailing winds which greatly contributed to windchill, occasional blizzards and the 5,000 foot average elevation of the plateau limiting aircraft lift capabilities prevented the Division Aviation Detachment from evacuating more than five wounded personnel during this period. These cases were only evacuated because the pilots were willing to risk themselves and their equipment in flights for maximum priority patients, when the normally zero-zero flying conditions ameliorated sufficiently to allow a calculated risk attempt to evacuate a single patient in the unheated cabin of an L-5 observation aircraft (Figure 3).¹

For the great majority of the patients who were thus roadbound, the Division Medical Service offered the best available service by completely committing all organic and attached medical support elements to evacuate the widely dispersed regimental medical services. The 1st Mobile Army Surgical Hospital and the 1st Platoon, 513th Medical Ambulance Company (SEP), 57th Medical Group were attached to the 7th Division during this campaign.¹ The circumstances under which this phase was conducted forced the utilization of medical elements normally held in reserve, in order to maintain a semblance of the normally high standards of



U.S. Army Photo

FIG. 3. The Commanding Officer, Company C, 17th Infantry Regiment, 7th Infantry Division, injured in action against the North Korean Forces near Kapsan, Korea, is air evacuated to aid station behind the front lines. 17 November 1950.



Photo: Author

FIG. 4. 1st Platoon, Clearing Company, 7th Medical Battalion in Pukchong, Korea, November 1950.

medical service. This action was recognized as a violation of normal policies and a calculated risk, but no other solution was available. Additional medical support elements from higher headquarters were not available for assignment or attachment at that time.

The best medical service that could be offered to wounded personnel was ambulance evacuation from the forward elements to the 1st MASH at Pukchong, a maximum of 164 road miles. The unusual circumstances of this campaign also made it necessary to evacuate patients from Pukchong to the supporting 121st Evacuation Hospital (Semimobile) at Hamhung, a distance of 80 road miles, making the maximum haul of patients with division ambulances a total of 244 road miles. Because of the condition of the roads, and a steep grade of 14 miles which required one way traffic control, the ambulances by experience could average only four miles per hour upon the plateau and mountain grades. The Division had no choice but to establish Clearing Platoons of the 7th Medical Battalion at intervals that would allow the patients a periodic respite from the prolonged ambulance haul. At approximately 40 mile intervals, wounded patients would be taken from field ambulances, brought into Korean school houses or other buildings used to

house these so called "Rest homes," medically examined and treated, given a hot meal and a "hot floor" ward billet for the night (Figures 4 and 5). In the morning, another hot meal would be served and the patients would be loaded into ambulances, together with their Marmite insulated food containers and charcoal burning Hibachi's. The vehicle would then start rearward on another wearying and painful ten hour haul to the next divisional medical treatment facility. It is not



Photo: Author

FIG. 5. Evacuation Point, 1st Platoon, Clearing Company, 7th Medical Battalion, 7th Infantry Division at Pukchong, Korea. November 1950.

surprising that under these conditions it might take a full week for certain patients to be evacuated from the front lines to the initial unit to the rear of the divisional medical service area of responsibility.

Major problems in cold weather injuries were added to the catastrophic tactical results of the Communist intervention; the ambush of the U.S. combat forces in the Chosin Reservoir area and the necessity of a rapid withdrawal to the Hamhung-Hungnam perimeter. The exact number of 7th Infantry Division personnel requiring medical evacuation for cold weather injury, as distinguished from or additive to other battle injuries, will not be known due to the mass air evacuation of Marine and Army personnel from Kotori. Casualties reported on divisional medical records indicate that approximately 1,139 Seventh Division personnel were evacuated for cold weather injuries during the period October 1950 to March 1951. In addition, a perusal of incomplete air evacuation logs from the Chosin Reservoir, Kotori and Hamhung, indicated that probably at least 919 additional divisional personnel were air evacuated primarily as cold weather injuries.^{1,2} It is well known that battle casualties suffered frostbite as a complication of other injuries, prior to and actually during medical evacuation, but data on this factor was not possible to collect during the period concerned.

A major part of this relatively high incidence of cold weather injury was attributed by competent personnel to the use of a relatively inadequate footgear for the climatic conditions encountered. The Shoe-Pac, M-1944, was ascertained by experience to be inadequate for personnel protection during these conditions, despite major troop indoctrination efforts; mandatory command responsibility for daily foot inspections and the daily delivery by the Division Quartermaster of laundered dry socks to troop units with the issue of Class I (Food) rations.³ The only troop units who could not thus secure an issue of fresh socks daily were those who were forced, by the exigencies of the military situation, to utilize assault and emer-



Photo: Author

Fig. 6. Hiller H-23 Helicopter, with other transportation media, at K-39 Airstrip, Taegu, Korea, April 1951.

gency rations. It is to be regretted that prototype windchill and casualty evacuation bags, for the protection of wounded patients during medical evacuation, arrived for field testing only after the coldest part of the winter season was terminated.

The first available helicopter medical evacuation support was given to the 7th Division after it had again returned to combat following the Hamhung evacuation and was committed north of Chechon during the month of January 1951. It is unfortunate that these first available Medical Helicopter Detachments were equipped with the Hiller H-23 helicopter which was, under these circumstances, critically underpowered (Figure 6). This particular helicopter was ascertained by experience, to be incapable of rising from the ground and carrying a single medical evacuation patient, although the aircraft was fitted with two casualty pods. Thus, for all practical purposes, this particular helicopter flying under the conditions experienced was totally useless for performing medical evacuation missions. It should be mentioned, however, that this model was subsequently modified by being refitted with an engine with greater horsepower, and became an effective evacuation means.

The arrival of Helicopter Medical Detachments equipped with the Bell H-13 helicopter provided the first practical means of offering major air medical evacuation (Figure

7). Due to the shortage of these aircraft, their requirements for many hours of unit level maintenance support to provide a flying hour, and a conservation of employment policy established by higher headquarters, these detachments were stationed at Corps level and dispatched through the office of the Corps Surgeon on an "on-call" mission basis. The availability of helicopter aircraft and pilots, the state of aircraft maintenance, the number and medical priority of missions called for, the type of combat mission that medical support was being provided for, the location of patient pickup points, and the category and evacuation priority established for types of wounds, influenced helicopter dispatch decisions in the office of the Corps Surgeon.

Guiding policies for the employment of helicopters generally included: daylight flights during suitable flying weather which could be completed prior to nightfall; pickup points that should be to the rear of enemy small arms and mortar fire; desirably a light wind to assist in establishing lift (a heavier wind would endanger the craft); pickup points to be not higher than a practical ceiling of elevation, which depended on the existing meteorological conditions; and no action to be taken which would unnecessarily endanger the pilot, the patient, or the aircraft.⁴ These policies thus tended to limit the forward movement of Army medical helicop-



Photo: Author

FIG. 7. Bell H-13 Helicopter, Hwachon Reservoir Area, Korea. May 1951.



Photo: Author

FIG. 8. Helicopter evacuation of burn casualty, north of Chechon, Korea. February 1951.

ters in front of battalion aid stations (Figure 8). There were circumstances when requests and flights were made for helicopter evacuation of friendly forward elements well in advance of the location of battalion aid stations, at isolated outposts and even behind the enemy lines to reach and rescue downed flying personnel, wounded patrol and reconnaissance personnel, but these flights were made predominantly by Air-Sea Rescue H-19 and H-34 helicopters (Figure 9).

It must be remembered that the early months of the Korean War were characterized by extreme fluidity and a tendency for the United Nations Forces to be limited by



Photo: 8th Trans Heli Bn.

FIG. 9. Sikorski H-34 Helicopter, illustrating cargo carrying potential. (Not photographed in Korea.)

geography, the road net and their mechanized equipment to the depths of the valleys. It was only later, after suffering repeated ambushes, partisan activities and guerrilla raids, that mopping up actions covering the crests of the formidable hills and the adoption of a "Scorched Earth" policy gave our troops to the rear of the front line a measure of security from enemy attacks. Until such time that the civilian population was excluded from the combat zone, no adequate control of these irregular enemy actions could be effected. An enemy division, for instance, penetrated our "front lines" during the late winter of 1950-1951 by allowing U.S. troops to bypass it and proceed forward through the terrain corridors. The enemy division's location was not established until it began major guerrilla type activities days later against the rear echelon of Division Headquarters and certain X Corps installations. Army ambulances were repeatedly ambushed, especially in night evacuations. The localization and final neutralization of this enemy force was not effected for a period of six days.

It should also be remembered that United Nations Forces maintained an operationally complete air superiority at this time, which greatly favored the employment of helicopters on medical evacuation missions. Light aircraft were also free to be employed without thought of enemy aircraft attack.

Battalion and/or Regimental surgeons were directed by division publications to initiate requests for helicopter evacuation. The Division Surgeon then would monitor these requests, prior to passing the evacuation flight request to the Corps Surgeon by phone.⁴ It soon became apparent that a considerable number of requests were being made by troop command personnel, in all good faith, but based upon the professional decisions of company aidmen and non-medical personnel, and violating many of the medical evacuation policies established by division and higher headquarters. To counter this tendency, the professional opinion of a physician on the site was required to triage requests for pickups forward of the battalion

aid station and behind the enemy lines. Since the battalion surgeons could not be spared for this purpose, and inasmuch as the author is air minded, it soon became practically routine for the helicopter pilot flying such a mission to make an en route landing for the division surgeon so that both could then proceed to the pickup point. Professional guidance could then be given the pilot, both prior to landing and on the ground, concerning the professional aspects of the forward helicopter evacuation. The aircraft commander, of course, had the final decision concerning the actions of his craft. He could, for instance, refuse to land, call for additional aircraft or aircraft cover, divert, augment or cancel helicopter flight missions, and request return flights from initial patient delivery landings. On the ground, the division surgeon could also provide professional level triage and/or treatment, as well as deliver whole blood for forward transfusions or critically needed medical resupply items. These flights also gave an opportunity for reconnaissance of the terrain, observation of the implementation of medical treatment and evacuation policies by forward elements of the regimental and divisional medical service, and were considered to have materially contributed to improvements in the quality of forward medical care and evacuation.^{6,7}

General guidance policies employed in assigning priorities for helicopter medical evacuation, based on type of wounds,⁴ as set forth by the 8th Army were:

Priority

1. Head injuries in coma, with signs of increased intracranial pressure.
2. Maxillofacial or neck wounds that are severe, or in which there is any respiratory difficulty.
3. All thoracoabdominal wounds.
4. Chest wounds in which there is any degree of respiratory difficulty or dyspnea.
5. All sucking chest wounds.
6. Abdominal wounds. (All those with wounds of the upper thigh, perineum, buttock, lumbar region and lower thoracic cage should be sus-

pected of having an intra-abdominal wound until this complication is ruled out).

7. Suspected gas gangrene.
8. Wounds with extensive muscle damage, particularly those of shoulder girdle, buttock, thigh or calf.
9. Wounds of extremities with impaired blood supply; with tourniquet in place; or with history of tourniquet application.
10. All traumatic amputations.
11. Compound fractures of long bones complicated by shock or hemorrhage, or without complete and comfortable immobilization.
12. All those in shock or who have been in shock, and those with continuing hemorrhage.
13. Burns of extensive areas or localized burns of severe intensity.

Two specific illustrative evacuations will be cited to indicate the value of professional level evaluation of forward helicopter requests:

I. During February 1951, a platoon of Company D, 32nd Infantry Regiment, 7th Infantry Division occupied the crest of an isolated hilltop northwest of Chongsen at an elevation of approximately 1,346 meters. The daytime temperature was below freezing. The unit battalion aid station supporting the platoon was approximately 13 miles behind their strongpoint. Due to the rough terrain, the forward point that ambulance jeeps could reach would have required a 6 to 8 hour litter carry to evacuate the casualties which resulted from a direct hit by enemy artillery upon the platoon position. The company aid man stated in his request that 9 casualties required helicopter evacuation.

When the request was forwarded to the Corps surgeon, it was ascertained that only two H-13 helicopters were available for dispatch. The division surgeon boarded the craft flown by the senior pilot en route, and both helicopters proceeded to the casualty location. During the forward run, personnel of the platoon were instructed by radio to clear

as large a landing space as possible on the sharp peak of the mountain top. This mountain top was unusual in that it had pine trees on it, in sharp contrast to the normally bare appearance of most Korean mountain tops. This spot was too remote for the Koreans to have denuded the forest cover. By the time of arrival of the helicopters, an area of approximately 36 square meters had been cleared, but this was surrounded by a rim of standing trees. There was insufficient space for both helicopters to land. The second helicopter continued to hover while the senior pilot landed. The infantrymen then were instructed to clear a take off passage on the upwind side to allow a loaded takeoff. The landing site was practically at the effective ceiling of the aircraft, and a dive down the mountainside would be necessary to gather flying speed and thus increase the available lift of the craft. Spare gasoline was left at the landing site to lighten the aircraft.

Triage and examination of the nine casualties resulted in the opinion that only three actually met wound priority requirements, although four additional wounded would require evacuation from the position. Two of the wounded could be dressed and remain with their unit. The senior pilot, with the division surgeon and two of the seriously wounded aboard, was barely able to lift the craft off of the ground for a takeoff. He dived the craft over the crest through the pathway and dropped a thousand feet in elevation, parallel to the mountainside, before he could bring the craft to a position more than a few feet from the mountainside. In the meantime, radio contact ordered ambulance jeeps and augmented litter teams from the battalion aid station while the second helicopter landed on the site. This helicopter loaded the remaining priority evacuee; one of the less seriously wounded in the remaining pod and one in the copilot's seat, and completed the evacuation flight by following the lead helicopter.

On account of the seriousness of the wounded, the patients were evacuated directly to the 121st Evacuation Hospital, as being the nearest available medical unit capa-

ble of caring for a thoracoabdominal wound and a head injury case. The two less seriously wounded brought this far were admitted, although they would have normally been capable of receiving adequate treatment at the clearing platoon level. On this helicopter evacuation run, sporadic enemy small arms fire was the only evidence of enemy action, although it was recognized that the shell causing the wounds had established fire control data which would have allowed it to shell the position during the time that the helicopters remained at or hovering over the platoons position.⁶

II. The second illustrative evacuation will be discussed because it was a request for a mass forward helicopter evacuation. At approximately 1700 on an afternoon late in March 1951, a report was received that a forward element of the 17th Infantry Regiment, 7th Infantry Division had received an intensive artillery and mortar barrage, causing 40 casualties which required air evacuation. The regimental commander made the request personally and showed great concern for his personnel. He asked that "all available" helicopters be dispatched, since the hill-top position could not be reached by any normal means for transportation of the wounded. He had made a command helicopter reconnaissance and reported that a long steep slope, subjected to enemy artillery, mortar and small arms fire would have to be traversed by litter bearers, and that experience had proved the danger of this type of exposed evacuation by litter during daylight hours, involving both danger to the patients and to his medical personnel. His command decision indicated that, in his opinion, it would be better to hazard a daylight helicopter evacuation, despite enemy fire, than to delay until darkness and use hand litter techniques. The seriousness of the wounded added to the urgency of the situation, for the regimental surgeon considered that a number of the wounded would require emergency surgery to live until darkness fell.

This unusual request was relayed by telephone to the Surgeon IX Corps, where the surgeon dispatched the two H-13 helicopters available on the flight line for a lead flight,

and relayed further support requests through 8th Army to Air-Sea Rescue units. The two H-13 helicopters picked up the author and proceeded to a position over the pickup site. Mortar and small arms fire was landing in the general area at the moment. Inasmuch as both the helicopter pilot and myself had received strict instructions not to endanger either the flying personnel, the aircraft nor his passengers, and since the pickup point was forward of the battalion aid station, a decision of great gravity must be promptly made. Should one land and risk damage to the craft, or should one abandon some of the wounded to almost certain death? The mortar fire abated while the discussion was held and the aircraft hovered. Knowing full well that the enemy weapons were zeroed in and the site observed, in response to frantic signals from the ground, the pilot decided to make a landing while keeping the second aircraft in the air. We dropped to the site, after receiving a report that further small and medium helicopter support was en route.

Whole blood had been carried forward on the author's lap and was quickly started for the more serious casualties. A rapid survey revealed that sixteen of the wounded required high priority evacuation. The second H-13 landed and took off as rapidly as possible after loading two of the most seriously injured casualties, both continuing blood infusion during the return flight. In flight blood transfusion was first used as a result of the suggestion of a medical helicopter pilot, and was rapidly adopted within the Korean theatre. This procedure again assisted materially in the care of this group of casualties.

Within a matter of minutes, two additional H-13's landed and departed with casualty loads. Turnabout time, under these circumstances, was reduced to the barest possible minimum. Shortly thereafter, two Air-Sea medium helicopters landed and were able to evacuate their full loads, thus allowing some nonpriority patients to be evacuated. Although these actions were compressed within the space of a relatively few minutes, enemy observations must have noticed the activity and

incoming mortar shells accelerated the departure of the aircraft. One H-13 landed at the division clearing station because of exhaustion of the blood from the infusion bottle, removed the needle and proceeded to the rear. All of the other helicopters proceeded directly to the 8076th MASH, where the staff cared for the casualties without loss of life. Additional en route support helicopters were contacted in flight and diverted back to their stations, when it was apparent that further air evacuation support would not be required. On account of the successful nature and outcome of the mission, the 8th Army Surgeon did not censure the helicopter pilot and myself more than mildly, although 7 mortar fragments had struck the lead helicopter during its relatively prolonged stay on the ground. One of these fragments struck and cracked the transmission case and could have resulted in aircraft failure. In this action, the calculated risk was elected by the senior pilot, on medical recommendation, as the action of choice. The lives of the wounded repaid for the damage to the aircraft and the loss of its operational capability for a period of a week.

SUMMARY

The author relates some of his personal experiences as Surgeon, Seventh U.S. Infantry Division, with especial reference to the development and utilization of policies concerning division level air evacuation techniques.

The influence of weather, terrain, and the characteristics of available fixed wing and helicopter aircraft are discussed in relationship to the provision of divisional medical service during the early months of the Korean conflict.

The period discussed includes the amphibious assault at Inchon, the capture of Seoul, staging at Pusan, and the subsequent amphibious landing at Iwon, the dash to the Yalu River, the Chosin reservoir engagement, cold weather casualties, helicopter employment policies and wound priority for air evacuation at forward levels. That the policies developed were basically sound was

demonstrated by their continued use during subsequent phases of the Korean action and in their adoption, in essentially unchanged form, as standard United States Army policy. The new Pentomic divisional structure continues to utilize these basic policies with only minor modifications.

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³ Seventh Division Standard Operating Procedure on Cold Weather Clothing.

⁴ Eighth Army Standard Operating Procedure for Air Medical Evacuation. This SOP included coordinated policies for the request and employment of Air-Sea Rescue aircraft.

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"... We march in the noblest causes—human freedom. If we make ourselves worthy of America's ideals, if we do not forget that our Nation was founded on the premise that all men are creatures of God's making, the world will come to know that it is free men who carry forward the true promise of human progress and dignity."

PRESIDENT EISENHOWER

Classification of Prisoners in American Civil and Military Correctional Institutions

By

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CLASSIFICATION is the diagnosis, treatment planning, and the execution of the treatment program for the incarcerated individual, while prisoners are those individuals adjudged guilty of some crime against society. The prisoners in the Civil and Military Correctional Institutions make up a large number of the American population, but still a relatively small number of the antisocial individuals in the community.¹

Classification is a comparatively recent development in penology. Some attempt at differentiating between prisoners was made under the Auburn System in New York State in the early nineteenth century, when prisoners were divided into three classes. The first were the "oldest and most heinous offenders," who were separated from the others and held in continuous solitary confinement. The second and third classes were put in solitary confinement cells for three days per week and one day per week respectively, and permitted to work outside the cells the rest of the time, though in silence.² This was intended as a reform of the so-called Pennsylvania system, which required strict isolation and continuous solitary confinement of all prisoners so that they could penitently reflect on their offenses and reform themselves. Continuous solitary confinement was found to be impractical and the modified Auburn system of daytime work and nighttime solitary confinement for all prisoners was generally adopted.

It was almost half a century later that the idea of treatment through the use of educa-

tion, vocational training and parole, as a means of reform and rehabilitation was introduced into the American prison system, at the Elmira, New York, Reformatory.

It was another half century before classification was instituted as part of the treatment process. The realization grew in the early years of the twentieth century that for any treatment program to be effective in rehabilitating the offender, much more had to be known about him than that he had committed a crime: that a careful study of each prisoner was necessary, and at least the immediate causes of the act had to be understood.³ Investigations of offenders were started separately by psychiatrists, psychologists, and sociologists in the second and third decades of this century, but these individual beginnings had little or no relation to the total prison program, and the need for a coordinated diagnosis and treatment program began to be felt.⁴

Much of the early work in classification was done in Massachusetts, New York, and New Jersey, and by the United States Bureau of Prisons. Three Classification Clinics were established in New York: at Sing Sing Prison in 1927, at Attica Prison in 1931, and at Elmira by the senior author in 1931. Earlier work had been started at Sing Sing in 1917, and at Elmira in 1916.⁵ As in the classification work instituted in Massachusetts in 1924, the emphasis was placed somewhat on the psychiatric evaluation of the offender. In the Elmira clinic, for example, the director of the clinic was a psychiatrist, and the administrative classification of inmates which determined custody requirements and treatment programs, was based to a great extent on a psychiatric classification. However, many persons contributed to the

The opinions expressed in this article are those of the authors and do not necessarily reflect the policy of the Department of Defense, Department of the Army or the Department of the Navy.

evaluation from their own professional examination and investigation of the offender, and the entire process was generally not unlike the present day initial classification procedure. This classification was integrated with the over-all handling of the inmate, and the persons who would be responsible for his supervision, education and training contributed to the planning of his treatment.⁵

The integrated classification system, which is a development of the past thirty years, is the one in most common use today. Under this system, the committee which considers and recommends a treatment program consists of the people who make the diagnoses of newly received inmates and the people who will supervise the program of custody, education, vocational training, and other activities which the committee as a whole decides on. The head of the committee is the head of the institution, or his authorized representative, which gives the decisions reached official recognition and weight. They are ordered carried out by the head of the institution and thus become directives which must be followed, rather than mere suggestions or recommendations made by one group which may be disregarded by another. This system also provides a better unity and mutual understanding between the various departments in carrying out more progressive and effective rehabilitation programs.

In some states, the classification unit is strictly a diagnostic one. It consists of the professional personnel who make the examinations and investigations of offenders and make recommendations for treatment based on their findings. These recommendations are reported to prison administrative officials who have the option of following or disregarding them. These units and their functions lack integration into the total program of the institutions, and in the absence of practical tempering by administrative and supervisory personnel, the recommendations are often too idealistic and unrelated to the capacities of the institution.

A growing development in the field of classification is the use of a Reception Center, as the senior author started at Elmira

Reformatory, within the framework of an over-all penal system.

Under the Reception Center program, offenders are committed by the courts to central receiving institutions, where highly specialized personnel make the diagnostic evaluation and determine a plan of treatment and rehabilitation. The center also determines in which institution in the over-all system the treatment is to be effected. This has the advantage of facilitating the placement of the offender in an institution most suited to his individual personality and requirements. To be fully effective, however, the Reception Center must be part of a large and diversified penal system, and each institution within the system must carry on the continued diagnosis and evaluation of the individual and necessary revisions in the treatment program which are the essential elements of a good classification system.

New York, California, and the Federal government have led the way in the development of the Reception Center system, as each maintains and administers a larger number of institutions, widely diversified as to the degrees of custody imposed and the facilities for rehabilitation available.

THE CLASSIFICATION PROCESS

The classification process consists of several activities which affect the offender from the time of his confinement to the time of his release. Indeed, the classification process is more directed at the eventual release of the person than it is toward his assimilation into the institution. It has been stated that successful parole is dependent upon the institution's work toward the betterment of the inmate through effective classification.⁶

The first phase is an admission and orientation program wherein the institution comes to know the inmate, and he the institution. This is generally accomplished during a period of isolation of the individual from the general institution population immediately after admission. The period varies in different states, sometimes lasting as long as two months, but thirty days is generally regarded as the acceptable minimum for in-

mates received directly into the classifying institution. The period may be shorter for those transferred from other institutions. A complete study of the individual is made by the personnel who comprise the classification committee. This includes the associate warden in charge of custody supervision, the social worker or sociologist, the educational, vocational and recreational supervisors, the chaplain, the chief medical officer, the psychologist and the psychiatrist. Each makes an intensive study of the individual from his own professional point of view so that the admission classification summary which is prepared will give, in addition to a history of the present offense and sentence, a complete picture of the individual involved, as a guide to treatment.

At this time also, the new inmate is oriented to the rules and facilities of the institution. He is told what will be expected of him, what he can expect in return, and how he can work toward his release before he can be influenced by other, older inmates who may give him incorrect versions of this information. This is done, too, to overcome the anxieties of the new inmate about penal life.

This period of isolation from the general institution population has other advantages in addition to the settling of the individual in his new environment with a proper understanding of it. It makes him readily available for the testing and examination, enabling these functions to be performed with the least possible delay so that the rehabilitation program can begin as soon as possible. Then too, it serves as a health measure, as the new inmate is checked for communicable diseases before being admitted to the general population.

The next step is the admission classification meeting, during which the diagnosis is translated into a treatment program through the consideration of the individual's abilities, desires and limitations, and all other factors which will relate to his confinement and potential rehabilitation. The admission classification summary is read and discussed, and a tentative program decided upon. The individual is then called into the meeting and

given the opportunity to participate in the planning of his own program, as he was during the interview and examination period.

Out of this meeting comes a planned program, which touches all phases of the inmate's institutional life. A decision is made as to the degree of custody required. This, to a great extent, influences where he will work and be quartered. The institution to which he has been committed may feel that the offender requires a greater or lesser degree of custody than that afforded by the institution and may thus recommend that he be transferred to another prison. Recommendation for transfer to another institution may be predicated on several other things. These are: to segregate hardened recidivists from the inexperienced offenders, to separate informers from those on whom they have informed, to separate persons involved in the same offense, to afford special medical treatment to the individual, or simply to relieve overcrowding which would be detrimental to all.

Also included in the total plan are work assignments based on the inmate's aptitudes, interests, opportunities for employment upon release, and available employment within the institution. For those who need formal education, this is included in the program. So are plans for recreational and religious activities and assistance to the inmate's family through community social agencies.

RECLASSIFICATION

The process, to be effective, cannot stop with the inmate safely assigned in the institution and his file returned to a drawer. His adjustment to the society of the institution has just begun. As he becomes more familiar with his new surroundings, the person will change. He may require more or less custodial supervision; he may achieve some of the objectives of his treatment ahead of expectation, or not respond to the program; he may develop new interests. There must be no "dead end" classifications if the inmate is to benefit from his institutionalization and return to the outside society better equipped to adjust to it. He must be observed at all times,

and his whole treatment reviewed periodically by the entire classification committee, or a sub-committee designated to handle re-classification. The intervals between considerations of the individual by the committee vary in actual practice. In some cases the date for a review of the treatment program may be set at the original classification, or a fixed schedule of reviewing each case every so many weeks or months may be prescribed. In either event, it is recommended that cases be referred to the committee at any time when observation of the individual shows such action to be warranted, or whenever the inmate requests it.

CLASSIFICATION AND PAROLE

Classification and parole are related parts of the over-all process of individual treatment which is intended to ultimately return offenders to the outside society fitted to live in it successfully. It has been held that parole depends for its success on good classification procedures. The methods utilized in classification in the institution are carried over into the post-confinement community life of the offender by the parole authorities. In California, classification and parole are supervised by the same agency, The Adult Authority. This agency actually has control over a person from the time he enters one of the state's Guidance Centers for initial classification; through treatment, reclassification, preparation for release, and the granting of parole; and finally until he is released from supervision in the community by parole officers.⁷ The Adult Authority also sets the period of confinement, under the provisions of California's indeterminate sentence law; based on their findings in the classification process. Normally, the sentence is not fixed until some months after initial commitment so that it can be based partly on observation of the inmate's reaction and adjustment to his new situation. Thus, this state has an integrated program designed to accomplish the complete reorientation and rehabilitation of the person who could not ordinarily adjust to society.

CLASSIFICATION APPLIED TO MILITARY OFFENDERS

The Armed Forces of the United States maintain their own penal and rehabilitation systems, in which classification plays a large part.

Milton⁸ states that "a substantial change in environment faces young recruits and inductees when they enter into the service. Off-hand, it might seem that to adjust to life in the military establishment would be quite easy. . . . But, in truth, we find that these young men are being thrust into an entirely unfamiliar social structure. . . . Prompt and sustained performance of duty is a requirement in military service, to insure it we must establish and maintain extremely high standards of conduct . . . which have no counterpart among those laws which govern the civilian population. Many of our offenders—our prisoners—might never have broken a law had they remained in civilian life."

The persons who enter the Services go through a classification process somewhat like the one that has been discussed, although not as detailed. However, tests, interviews, and the needs of the Service are considered in assigning the person to a Service occupation or specialized training. In some cases, during the initial classification or the initial training stages it is discovered that the person is unsuitable or undesirable for service, and provisions are made for administrative release.

Some get through the initial screening and later commit serious offenses, both of a strictly military nature and of the type familiar in civil life. Some even do these things in an attempt to secure an administrative discharge and thus shirk their obligations. To help the offender adjust or readjust to military life, the Services operate their own correctional facilities, manned and administered by military personnel.

The objective of these facilities is the promptest possible restoration of the individual to willing and honorable service. When it is apparent that this cannot be accomplished, an attempt is made to fit the person

for satisfactory readjustment to civilian life.

The philosophy of individual treatment is embraced by the Services, and classification procedures necessarily play a large part.

CLASSIFICATION IN THE ARMY

The confined Army offenders are segregated from others in the facility while undergoing admission orientation period. The classification summary is made by the confinement officer, or his assistant, based on information from a chaplain, medical officer, the individual's unit commander, and other commissioned and non-commissioned officers who may be able to contribute to a professional evaluation of the individual concerned.

Where psychological and psychiatric personnel are not part of the staff of the installation, the inmate is examined by Army Medical Corps personnel of the post Mental Hygiene Clinic to evaluate his intelligence, personality characteristics and rehabilitation potential.

The confinement officer, who is the person responsible for the proper operation and administration of the facility, applies the results of the study and evaluation to the carrying out of the objectives of rehabilitating the inmate for service or civilian life. The minimum required custody is imposed in each case, and maximum stress placed on unarmed supervision wherever possible.⁹

Constant reclassification reviews are held in an attempt to reduce the required custody grade to the minimum wherever possible in terms of sound policy and the inmate's adjustment.

Prisoners are segregated by custody grade and rehabilitation potential (where facilities are available), and further provisions are made for disciplinary and administrative segregation. The latter is imposed in the interests of good order in the facility in cases of informers, homosexuals and others who might, by their presence within the general population, cause trouble to arise, but in themselves create no disciplinary problem.

Installation parolees and minimum custody grade inmates are allowed to train with

their regular units when this will aid in their rehabilitation and successful adjustment to military life.

CLASSIFICATION IN THE AIR FORCE

The Air Force began testing the reception center system, in 1955, with the establishment of the 3750th Confinement Screening Group at Sheppard Air Force Base, Texas. After a 30-day screening period, the classification committee recommends action to the base commander, who has the authority to return the offender to duty, transfer him to a retraining organization or U. S. Disciplinary Barracks, or discharge him to civilian life.¹⁰

CLASSIFICATION IN THE NAVY

Delinquent and recidivistic youths are a source of enormous expense and impediment to the Navy. Efforts directed toward the rehabilitation and integration of these functionally antisocial persons are sometimes effective. Frequently, however, all measures that are offered or forced upon the man fail, and at length his offenses lead to a discharge through court-martial (bad conduct or dishonorable discharge). Short of this, his repeated petty offenses may lead to administrative separation for reasons of unfitness (undesirable discharge), or unsuitability (general discharge).¹¹

The career of the psychiatrically handicapped serviceman deserves some comment. Although many such men are able to complete their tours, their actual functioning is often unproductive. They may complete "successful" tours only at great expense to the service in the form of hospitalizations, accidents, and legal and punitive actions. In addition, there is the effect of such men on the functioning and morale of their units.

The additional costs of utilizing marginal manpower have been demonstrated concretely in a number of follow-up studies of the service careers of these men.¹²⁻¹⁵ When marginally adjusted men were sent back to duty, the number of hospitalizations and disciplinary difficulties was several times that of their normal colleagues. Other studies have

demonstrated that, where early psychiatric screening-out is sparingly used, there is a substantially higher rate of psychiatric discharges at later stages. Conversely, the liberal use of screening-out procedures early in training is correlated with a reduced incidence of later psychiatric discharges.

Hankoff¹¹ points out that "the military psychiatrist is in a unique position with regard to available data. He is the only military person available who is equipped to evaluate all of the aspects of the total personality that must be considered: health record, service career, character structure, and psychopathology. The military psychiatrist is equipped to evaluate and synthesize the medical, military, and psychiatric facts present. The strategic use of the military psychiatrist in evaluating brig prisoners can be of high economic value in cutting short recidivistic careers and eliminating the legal requirements entailed in these careers."

COMMENTS

The senior author found that since 1928 he examined 6,356 court cases, of which only ninety-two were civil cases, and eighteen involved the charge of murder. Of all the cases examined, the diagnoses were: Normal, 36.20 percent; Mental deficiency, 9.80 percent; Disorders caused by impairment of brain tissue function, 4.50 percent; Psychoneurotic reactions, 2.70 percent; Psychotic reactions, 6.30 percent; Personality pattern disturbances, 3.95 percent; Sociopathic personality disturbances, 36.55 percent.

While with the Navy during WWII, and for a time assigned to the New York Induction Center, he concluded that at least 30 percent of the young draftees would be unable to adjust to the Navy, but the Center rejected only 10 percent, while 10 percent were discharged during initial training, and 16 percent developed psychiatric disabilities, at a later time. These persons are now a great expense to the Veterans Administration.

SUMMARY

Classification is the psychiatric and sociological diagnosis of prisoners and is an es-

sential procedure in the proper treatment and rehabilitation of the incarcerated person. This individual handling of prisoners, which was started at Elmira Reformatory, New York in 1931 has been extended to other State institutions and the Federal prisons. It has, to a limited degree, been used in the Armed Services.

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Drugs in Asthma: Their Clinical Usefulness and Their Dangers

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AND

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THE person with asthma wheezes and is dyspneic because his airways are narrowed due to increased secretions, edema of the lining membranes and spasm of the bronchial muscles.¹

Emphasis, during the past 25 years of study on asthmatics by immunological methods has resulted in so many advances in our knowledge of handling these patients, that careful study and cooperation by physician and patient leads to control of the seizures and prevention of their recurrence in the majority.

While there are no drugs which will cure the allergic state or even prevent an attack where the allergic body is exposed to a large dose of specific allergen, various drugs do assist in the control of individual attacks and their use should be continued until the asthmatic paroxysms are controlled by specific means. Among drugs most effective for symptomatic relief are the sympathomimetics, xanthines, iodides, sedatives, corticotrophin (ACTH), cortisone, antibiotics, oxygen or helium gas mixtures, anesthesia and antihistamines. Some remedies, such as the inhalation of smoke from nitro papers and stramonium leaves, the antispasmodics and opiates have been in use for many years.

Most of the patients whom we see, have used many of these drugs and with good effects. In some, however, their use has been followed by unfavorable results and even by death. It seemed to us, therefore, that it might be well to review briefly the essential actions of these drugs, their field of clinical usefulness, their dangers, and to point out a

few details of the methods of their administration.

Drug treatment of asthma should be given to accomplish one or more of the following:

1. To promote resorption of edema and relaxation of bronchospasm of the bronchial tree, thereby increasing the diameter of its component parts;
2. To thin the secretions;
3. To correct pulmonary hypertension;
4. To maintain protein, carbohydrate, electrolyte and water balance;
5. To diminish or overcome the fears and great anxiety of the patient.

EPINEPHRINE

Sympathomimetics dilate bronchial muscle, absorb exudate, and reduce swelling. Epinephrine is the active principle of the medulla of the suprarenal gland. Its action consists in a stimulation of the peripheral end organs of the sympathetic nervous system, directly or indirectly.² It is poorly absorbed from mucous membrane surfaces, slowly absorbed after intramuscular or subcutaneous injection but has an immediate action following its intravenous administration. The action is of very short duration since epinephrine leaves the bloodstream very rapidly and is soon oxidized. Its effect can be maintained by continuous intravenous administration of small amounts. Solutions are very unstable unless a preservative is added. The effect of this drug on a patient in an attack of asthma is startling, when observed for the first time. Within a matter of several minutes after the subcutaneous injection of a suitable dose the paroxysm begins to subside and has completely cleared within a half hour in an uncomplicated patient with asthma. The effect may last for hours and may be explained on

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the basis of slow absorption from the site of injection. The therapeutic amount for relief is extremely small, usually much smaller than recommended. It is a safe rule to give 0.2-0.4 cc of the 1-1000 solution (3-6 min.) subcutaneously. This dose is usually adequate for relief and will avoid the attacks of palpation, tachycardia cardiac irregularity, intense throbbing headache, vomiting, intense excitability, tremor, blanching of the skin and marked exhaustion associated with larger doses of epinephrine.

Patients who have recurring attacks of asthma should be taught to give themselves injections of epinephrine. When it is given at the first sign of the attack, it will usually require a smaller dose of the drug. This will also minimize the fear of the attack. Properly given epinephrine is still the most valuable remedy we have for the relief of the acute attack of asthma.

Epinephrine in oil may be used but should be reserved for maintenance of the relief gained from the use of aqueous epinephrine. This preparation is less predictable and in $\frac{1}{2}$ to 1 cc of the 1-500 solution dosage, can be harmful.

Epinephrine in 1-100 solution is used only for aerosol inhalation. It acts by its local vasoconstricting effect. Aleveaire or Zephirin as wetting agents may be added to help remove thickened secretions. These solutions must be aerosolized over a long period and only with large amounts of solution may the desired effect be obtained.

There should be no fear of using epinephrine in asthmatics with hypertension. The pressure in most cases will drop when the asthmatic attack is controlled.³

EPHEDRINE

Ephedrine, either as a sulphate or hydrochloride,⁴ acts like epinephrine, but is much less effective. It has the advantage in that it may be given orally. Ephedrine is poorly tolerated when given alone. It may produce wakefulness, bad dreams during sleep, marked weakness, nausea, sweating and in some patients, cardiac irregularities. The cerebral symptoms can be controlled by ad-

ministering a small dose of some hypnotic with each dose of ephedrine. It has been our practice to combine it with a long acting barbiturate such as phenobarbital. A satisfactory combination is $\frac{1}{8}$ to $\frac{1}{4}$ grain of phenobarbital to each $\frac{1}{4}$ to $\frac{1}{2}$ grain of ephedrine. This dose may be given four times daily to obtain a sustained effect.

In elderly men ephedrine may produce spasm of the bladder sphincters with urinary obstruction. Patients should be asked if they have any difficulty in starting the urinary stream while taking the drug, and if these symptoms become annoying the drug must be stopped. Similarly, women with relaxed pelvic floors often develop very obstinate constipation while taking ephedrine.

There are also many synthetic ephedrine-like drugs available. Some of them have fewer side effects than ephedrine, none have more therapeutic effect and all are more expensive. With a suitable barbiturate, ephedrine is still the best one to use in our experience.

AMINOPHYLLINE

Aminophylline⁵ acts by relaxing bronchi, stimulating the respiratory center and by lowering the pulmonary arterial pressure, which is always elevated in an asthmatic attack. The effect begins within seconds and may last for several hours. It is more effective in patients with organic emphysema secondary to asthma than in those without this complication.

Aminophylline is usually administered intravenously. There are two schools of thought as to how fast to give aminophylline, the amount, and in what dilution. Those who give it fairly rapidly state that it should be given until the patient experiences tingling of the face and gets the first deep inspiration. When this effect is obtained they say, the injection should be stopped, as the full effect has been obtained. When it is administered in this manner the dose varies from 0.1 to 0.5 gm. They contend also that aminophylline should not be added to intravenous fluids as it is ineffective in such high dilution. We do not agree with either of

these contentions, and it is not consistent with our experience or that of others. If aminophylline is given by the rapid method, it carries with it considerable danger.

Aminophylline may now be given effectively by mouth, as preparations are now available which allow for adequate dosage to be taken without the common gastric irritation and provides for higher theophylline blood levels. One type of preparation contains aluminum hydroxide and aminophylline mixture and another is a theophylline derivative, the theophylline salt of chlorine. The latter appears to be more soluble, provides higher theophylline blood levels and is free of the common gastric irritations associated with oral aminophylline. These preparations are good in oral aminophylline therapy.

Rectal use of aminophylline by suppository or administration of one to two ounces of a 2½ to 5% solution rectally, has been helpful if given prior to bedtime. It should be mentioned that suppositories containing aminophylline in cocoa butter combination are effective in most instances and are less irritating.

POTASSIUM IODIDE

This drug assists in the mild paroxysms of asthma by thinning the sputum. It is particularly beneficial in those asthmatics with secondary bronchitis. Since the iodides are absorbed from the intestinal tract with amazing rapidity, their full effect is obtained by oral administration and there is no real justification for their administration by the intravenous route. When iodides are used, however, the patient should be questioned regarding sensitivity to them.

SEDATION

Mild sedation is always beneficial in asthma.⁶ The drug used should have a minimal depressing effect on the respiratory center. Barbiturates, chloral hydrate, and paraldehyde may be used for sedation in asthmatics. Since paraldehyde is a self-sterilizing drug, it may be administered intravenously. It should be used only in status asthmaticus when more profound sedation is desired and should be given slowly until the

desired effect is achieved. This requires a dose of from 1 to 5 cc.

OPIUM AND DERIVATIVES

Opiates should never be used in asthma, especially morphine, because they are respiratory depressants, anti-expectorants, habit forming and may be lethal. Some of the derivatives are recommended because they are supposed to produce bronchodilatation in certain doses. However, when one reviews the pharmacological action of the drug, one finds that its effects are by no means constant and that narrowing of their lumen may follow its administration. During the past twenty-five years we have been impressed by the almost unanimous opinion among internists and allergist that the use of morphine is unnecessary, frequently harmful and at times fatal. The wise observation and admonition expressed by Hyde Salter over a century ago that, "to opium in asthma, I myself have great objection, I do not mean to impugning the correctness of those who profess to have seen benefit derived from it; all I would say is, that I am not certain I have ever seen it do good, that I have often seen it do harm, and that I should have antecedently expected, from its known physiological action, that it would be prejudicial, and tend to increase the condition for which it is given. . . ." He then discusses the central effects of opium, considers them harmful and then says, "but, beyond this, opium seems to have a specific tendency to excite involuntary muscle action and induce temporary spasm. . . . But I would not let any theoretical objection run counter to clinical evidence; and if experience said, 'give opium,' no theory should prevent my giving it. Our own experience, however, coincides with these objections; and I am disposed to think that the frequency with which it is given in asthma depends upon an unthinking following of routine and a want of close and exact observation."

OXYGEN

Oxygen is a potent anti-expectorant which should be used only in the presence of

cyanosis and then only if the cyanosis does not deepen; upsetting the respiratory gas exchange which the hypoxic patient has accustomed himself to maintain via the aortic and carotid reflex mechanism.⁸ If given prior to the resumption of proper control by the medullary center may result by producing a period apnea, which can result in delirium, coma and even death. The delivering of oxygen by intermittent positive pressure may prevent the above condition. A combination of helium and oxygen mixtures in 20-80% ratio may be used in severe cases, and the intermittent positive pressure equipment in administering oxygen is now preferred in most instances.

ANESTHESIA

Any form of general anesthesia in asthma should be approached with great caution; however, years of experience had shown that a mixture of ether and olive oil given as a slow retention enema will often give relief in the stubborn "status asthmaticus," when most other procedures have failed the patient will become anesthetized during the administration of the enema. The marked dyspnea may seem to continue, but the rest and sleep acquired will be of distinct benefit to the patient. The dose of ether is 4 ounces of ether with equal parts of olive oil and followed by one to two ounces of each every two to four hours for several doses. Often after subsidence of symptoms or rest with the ether and oil mixture, most patients will again respond satisfactorily to epinephrine. Nitrous oxide and other anesthetics have been disappointing in the relief of severe asthma.

ANTI-HISTAMINES

Antihistamines have been disappointing in asthma. They relieve the nasal symptoms in allergic Rhinitis, but have too slight an action to affect the lesions in the bronchial tree. It is useless to prescribe them in the largest number of asthmatics.

ELECTROLYTE, FLUID, CARBOHYDRATE BALANCE

Electrolyte balance must be maintained and fluid intake encouraged to relieve gen-

eral dehydration and aid in the elimination of the sticky mucoid bronchial plugs which frequently form. During asthmatic attacks there is loss of sodium and water, and much of the glycogen reserve is mobilized, especially when much epinephrine has been used. It becomes advisable to give 5% glucose in saline or distilled water with other appropriately needed medication, as indicated by the general condition of the patient and appropriate laboratory studies. Calcium has been used in asthma because of its alleged antiedemic action in diminishing cellular permeability.⁹ It has been shown that there is no clinical effect when calcium is administered to asthmatics with acute symptoms and that there is no evidence to indicate that it has any direct effect on the recurring attacks.

CORTICOTROPIN ACTH AND CORTISONE AND OTHER STEROIDS

Corticotropin (ACTH) or the steroids (cortisone, hydrocortisone, prednisone, prednisolone, methyl prednisolone and triamcinolone) should be used only to relieve status asthmaticus after prolonged careful treatment has failed, or to supplement therapy in previously unsuccessfully managed seasonal pollen asthma. These hormones should not be used in the acute paroxysmal attacks of asthma, because they do not work fast enough. As far as present evidence indicates it is clear that corticotropin (ACTH) and the steroids cure nothing and one should therefore not prescribe these powerful hormones too lightly.

It should be understood that during the past ten years corticosteroids have proven of great value both experimentally and clinically. They have proven to be life saving in some instances and have also changed our approach in the management of other chest diseases. The newer steroids should be used with the same caution as the older preparations, for only experience gained with their judicious trials will enable more precise evaluation.

It has been found that in hospitalized patients, it is advisable to begin with 20 mg. of corticotropin added to each liter of 5%

glucose. To this solution 1.00 gm. of aminopylline may be added and given by slow continuous intravenous drip over an eight to ten hour period (40 drops per minute). In very severe asthmatics it will usually be necessary to give from two to three liters of this solution in 24 hours (containing 40-60 mg. of ACTH). The asthma will usually diminish promptly, and the patient will feel better in every way, eating and sleeping better. The corticotropin is then progressively reduced and the patient may be discharged from the hospital within several days.¹⁰ Thereafter he should be put on ACTH Gel, beginning with daily doses of 40 units and gradually reducing the Gel to the smallest possible maintenance dose.

Cortisone and the other steroids are similarly given in asthma which is refractory to the usual procedures.¹¹ Orally cortisone had been found to be as effective as injectable cortisone.¹² It had been the common experience of those working with asthmatics, that the steroids should be started with maximum dosage and reduced gradually to the smallest maintenance dose or even to stopping the hormones in some cases. With the recurrence of symptoms, in spite of the small maintenance dose, the original maximum dose schedule must again be repeated. Most physicians are now familiar with the dose schedules. Some of the dangers in the use of these powerful hormones are related to well understood physiological actions, in association with increased adrenal function.¹³ If one considers the Cushing Syndrome as hyperadrenocortical function (particularly as regards the 11-oxygenated or formaldehydegenic steroids of the compound E type), then we see the classical state which develops if a patient is treated too long or too strenuously with the steroids and when precautions are not heeded.

Patients develop an incapacity for normal protein synthesis and an increased breaking down of body protein to carbohydrate. This impairs all or most processes which have to do with the building of healthy protein by restoring and replacing of protein, as in the healing of wounds, growth of hair, etc. It

can completely stop, at least temporarily, the normal growth of children.

There is no known way to stop these effects except by stopping these powerful hormones. The recommending of low sodium diet will prevent fluid retention. The use of potassium chloride is essential to prevent cardiac disturbances. The contraindications to these hormones are well known and should merely be noted e.g. some types of tuberculosis, peptic ulcer or bleeding anywhere from the gastro-intestinal tract, psychoses and diabetes. They should be used only with great caution in hypertension or infection.

Penicillin-like allergy has also resulted from the use of ACTH and cortisone. These reactions have varied from a mild urticaria to profound shock and even death. The hormone is to be stopped immediately and other therapy prescribed.

Belladonna, Stramonium, Hyosyamin depend on their atropine content for their action. Atropine paralyzes the innervation of the bronchial muscles and glands, causing bronchial dilatation and lessening of the mucous secretions. The best effects have been noted by inhalation and it is still in use by many of the older asthmatics, who purchase prepared powders containing these ingredients which are burned and the smoke inhaled. Asthma cigaretts contain some tobacco and lobelia in addition to other volatile oils like anise. The inhalation of this smoke is followed in a few minutes by cough and expectoration of the mucus plugs which were occluding the bronchial stem. Atropine has very slight effect given in any other way for asthma unless given in almost toxic doses. There is little need for any of these drugs today.

Infection is frequently either a primary or contributing cause in severe asthma and should be treated whenever present. Asthma incident to acute infection responds promptly to antibiotic therapy; that associated with chronic infection responds favorably but less dramatically and in proportion to additional methods of treatment used. The types of antibacterial agents are too well known to be discussed in this paper. Their use and

dangers are equally well known. It should be used in adequate dosage and continued for a sufficient length of time until a cure of the infection is complete or chronic infectious asthma may result. Aerosol therapy with the antibiotics has lost most of its early popularity and should be used only with great caution. We have seen many patients sensitized with antibacterial agents after one or two aerosol sessions, and we have discontinued its use for the purpose of controlling bronchial infection as a routine procedure.

There are doubtless other drugs which have been used from time to time with some apparent effectiveness. Space does not permit discussion of their merits.

SUMMARY

Before attacks of asthma are prevented by proper allergic study and management, it is usually necessary to use drugs to ameliorate the acute symptoms. We have outlined the drugs of definite and proven value, and to point out the dangers of those in general use. Emphasis has been placed on the use of drugs which tend to normalize the physiologic-pathology of the lungs in asthma. Some pitfalls and dangers in the use of corticosteroids and corticotropin have been discussed. It should be remembered that drugs have good effects if properly understood and judiciously used. They have no effect or bad effects if used inadequately or without regard to their effect on the function of the patient.

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Anaphylaxis—A Personal Experience

By

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ALL of us have been annoyed at one time or another by one of our colleagues who rises to speak pontifically on some unusual medical entity, when we discover his experience is limited to a very sparse number of cases. So it seems logical to state at the onset that the author's experience with anaphylaxis is limited to one case. Nonetheless, his ability to evaluate it, especially subjectively, was peculiarly enhanced by the fact that the patient was himself.

In the course of about a five month period, I had several episodes of folliculitis of one or the other nostril, and each of these episodes responded nicely to oral penicillin and bacitracin ointment topically. The day of this occurrence, another such episode had begun in the early afternoon. Bacitracin was used right away, but the soreness was increasing and when I got to my quarters, I took four oral penicillin tablets (800,000 u). At about 2130 hours, I took four more, the last of my supply. For this reason, I decided to go to the hospital and take penicillin intramuscularly, thus eliminating the need to awaken for oral medication. 600,000 units of procaine penicillin were administered at approximately 2235 hours. In past years, some eight to twelve such injections had been received, none of which caused an allergic reaction of any kind.

Returning to my quarters I prepared for bed. While in the bedroom, about 2300 hours, moderate tenesmus was experienced. This was followed rapidly by a violent pounding sensation at the top of my head and almost at once by a sensation of extremely heavy radial pulsations. Added to these symptoms was the sensation of a generalized erythema. Although these symptoms appeared successively, I doubt that the total elapsed time was

more than 1½ minutes. It was probably at this point that I realized what was taking place, and told my wife to call the hospital O.D. and tell him I was having anaphylaxis and to please hurry. I lay down on the bed, vomited suddenly and uncontrollably about three times, and for the next few minutes the account can no longer be one of personal observation.

There is no recollection of dashing to the bathroom, which I am told I did, and which is where I was when the medical officer arrived. A quotation from his case report seems in order here: "Patient was pulseless and unresponsive. Apex beat 50-60 per minute." 0.5 cc of adrenalin was administered subcutaneously and response began in a few minutes. A second injection was given five minutes later. I regained consciousness to find myself the center of some attention and also to hear a sound which has often caused me some annoyance in the past. This is the noisy, sighing exhalation of breath which has always seemed pseudo-dramatic and needless. I discovered to my consternation that the offender was I and simultaneously discovered two more things: the sound was not controllable and it no longer seemed quite as annoying as heretofore. Briefly thereafter, there was some strange dyspnea. In the first phase, although I could exhale well, inspiration was short and difficult, and in less than two minutes the situation was reversed. After a similar interval, normal respiration recurred. Recovery was rapid after this and the adrenalin side-effects gradually subsided.

It is perfectly natural that more significance will be attached to this therapeutic misadventure by me than by anyone else. On the other hand, relating the incident may have a beneficial effect. The literature is replete with pleas to stop needless administration of the potent drugs and antibiotics of our current armamentarium. To a lesser

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extent, warnings are issued about untoward reactions. But it is a rather sobering thought to realize that anaphylaxis is possible with no prior history of sensitivity despite the fact that penicillin has been taken several times previously. Were it not for the fact that my quarters are about two minutes distant from the hospital, and that I am a physician and could therefore recognize the symptoms, this article, if written, would have a different author.

Once anaphylaxis ceases to be just a word and becomes an experience, whether it be subjective or objective, it is impressive indeed. Many patients receive injections from which anaphylaxis is a possible result, however remote, on an out-patient status. This is perhaps especially true of penicillin. It would not seem to be too cautious to have these patients remain in the out-patient department for one-half hour following such administration.



BOOK REVIEWS

THE MAMMALS OF NORTH AMERICA. Two volumes. 1083 pp., addenda—5 pp., double index—69 pp., illustrated. By E. Raymond Hall, Ph.D., Chairman of the Department of Zoology and Director of the Museum of Natural History, Kansas University; and Keith R. Kelson, Ph.D., Division of National Science Foundation. The Ronald Press Co., New York. \$35 per set.

This is an erudite two volume work on the mammals of North America. Each volume measures 8 × 11 inches and is profusely illustrated in black and white. Maps are used freely to show habitat. A detailed description of the mammals is given including order, family, genus, and subgenus. Location and habits of the animals are described.

Following that part of the work giving the description of the mammals there is a section on "Preparing Study Specimens of Mammals," an addenda, an extensive bibliography of 30 pages, and a double index (vernacular names and technical names).

This work will be valuable for scientific libraries and those persons engaged in the teaching and study of Zoology.

CANCER DIAGNOSIS AND TREATMENT. Edited by John B. Field, M.D., 28 contributors. 796 pp., illustrated. Little, Brown and Company, Boston and Toronto. Price \$18.50.

In this book there are twenty chapters including

an introductory chapter, a chapter on medical care of the cancer patient, one on cancer in children and chapters on chemotherapy and radiotherapy. The other chapters are devoted to tumors of the various body sites, such as head and neck, breast, chest, stomach, etc. In each of these chapters is a general discussion of the tumors of the particular sites and paragraphs on diagnosis and treatment.

All contributors are recognized leaders in their special fields and all present their subject matter in a concise, readable form. Illustrations are used freely and a bibliography appended to each chapter.

The book is a practical text for both medical students and practitioners. It contains the essential information needed for diagnosis and treatment of cancer without lengthy discussions of theory or history.

The need for such a book which will appeal to the practitioner is emphasized by the editor's statement in the preface that "the delay of the physician in instituting proper treatment has become greater than that of the patient in coming for a first examination." The public has become cancer conscious due largely to the publicity efforts of the American Cancer Society, but doctors are not sufficiently cancer suspicious. Too often an attitude of "wait and see" is adopted instead of performing a biopsy.

COL. HUGH R. GILMORE, JR., USA, RET.

EDITORIALS

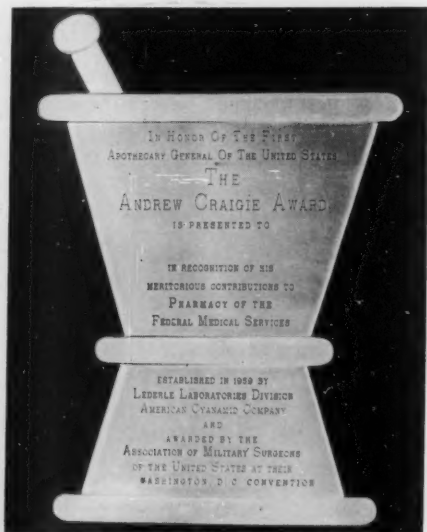


Chase, Ltd., Photo

JAMES W. SKINNER, Lederle Laboratories (left), and Col. R. E. BITNER, editor *Military Medicine*, examine Andrew Craigie Award Plaque.

Craigie Award

ANNOUNCEMENT was made in these columns in March of the establishment of the Andrew Craigie Award for outstanding accomplishment in pharmacy



Chase, Ltd., Photo

within the Federal government services. As explained at that time the Award has been made possible by the Lederle Laboratories Division, American Cyanamid Company.

The first award, a photograph of which is shown here, will be presented at the Honors Night Dinner of our Association's 66th Annual Convention, November 11, Washington, D.C.

Peace Through Medicine

PEACE in the world may come through medicine. That peace will never come through armaments. We have the experience of ages to prove the latter statement. Of course, only the future will prove the first statement.

All persons at some time suffer pain—all must die. To alleviate pain and to lengthen the life span is the aim of the medical profession and its allied sciences in all nations. What better means then have we than through the exchange of experiences of medical people. We might be opposite in political and religious ideologies but certainly we can not be too far apart in the matter of relief of bodily ailments.

Whatever the means that are used whether they be the MEDICO program, the World Health Organization, the World Medical Association, or a combination of these or similar organizations, the bodies and souls of the masses of people of nations can be reached through the good that medicine can do for them.

Doing good for good's sake will be recognized, probably not at first but eventually and in most cases in not too long a time. Here is the opportunity of medicine. Politics, propaganda, and enforcement of ideas if mixed with this service that medicine has to offer would shatter the good that any medical efforts would do. So unless we intend

to do good simply for the sake of helping out our fellow men we as individuals or as a nation should not even participate in such a movement.

There is plenty of evidence to prove that through such services to humanity the United

States does not intend to gain territory or political position. We as a nation are interested in "Peace on earth, and good will to men." If through medicine this can be done, and we believe it can, let us speed up our efforts.



"It is on such an occasion as this that we can reason together—reaffirm our devotion to the country and the principles of the Declaration of Independence. Let us make up our mind that when we do put a new star upon our banner, it shall be a fixed one, never to be dimmed by the horrors of war, but brightened by the contentment and prosperity of peace.

"Let us go on to extend the area of our usefulness, add star upon star; until their light shall shine upon five hundred millions of a free and happy people."

ABRAHAM LINCOLN, February 22, 1861, when he raised
a new flag over Independence Hall, Philadelphia.

The Association of Military Surgeons of the United States

Founded 1891, Incorporated by Act of Congress 1903

Suite 718, New Medical Bldg., 1726 Eye Street, N.W., Washington 6, D.C.

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Around the World

(Ser. III, No. 8)

By

CLAUDIUS F. MAYER, M.D.

HAWAII, Israel, Taiwan, India, and other countries of Asia and Africa, wherever the modern insecticides have been used for years, may soon become again *sanctuaries of bugs*. Parasitologists in these countries observed that bedbugs, for instance, including the common *Cimex lectularius* and the tropical variety (*Cimex hemipterus*), are more and more resistant to such insect-killers as alpha- or beta-chlordane, aldrin, dieldrin, isodrin, endrin, etc. The resistance of bedbugs to these poisons is very similar to the growing immunity of other insects, of mosquitoes and flies, to the well-known chemotherapeutic agents. It is very likely that the *resistance of insects to poisons* is a matter of heredity, which is also suggested by the Eighth Report of the Expert Committee on Insecticides of the World Health Organization.

A medical captain of the *Brazilian Navy*, who has been studying the chances of *rescuing shipwrecked persons*, vividly remembers the catastrophe of the cruiser *Bahia* in 1945, during the last war, when only thirty-two persons were able to remain alive out of a crew of 500. The captain, who used to be a physician aboard this cruiser, has been experimenting to increase the survival rate of shipwrecked persons by various means. In a series of tests he found that a chemical compound, which he called "Dessalgante I.P.T.," removed the salt from the *sea water and made it drinkable*. He also developed a food ration, called "R 7" which could keep a man alive for eight days. Modern life-belts and life-rafts also are now available in the Brazilian Navy.

Reports come from *British Honduras* that the disease of *Cutaneous leishmaniasis* has been more and more frequently observed among gatherers of chicle. The "*chicleros*," as the native people call the gum col-

lectors, are gathering the latex, from which the chewing gum is partially made, by bleeding the bark of the sapodilla trees. These men are living and working in groups of three or four. Entering the forest at the start of the rainy season, they live like nomads, moving from one camp to another, and they come out of the forest only when the rainy season is over. One of their camps was found near the forest-choked Maya ruins at Caracol. Many of them could be found after the rainy season at places of amusement. Their examination showed that cutaneous leishmaniasis was most often in the form of an ulcer of the ear, the so-called "bay sore." Some of the ulcers were of over 30 years' duration. A search for an animal reservoir could not be found, though the armadillo was suspected. The infection is carried by the *Phlebotomus* which is represented by many species in the forests of Honduras.

During the years 1946 to 1957, the five most important public hospitals in Caracas admitted over 150,000 surgical patients. The analysis of their case histories showed that only 188 patients had to be operated upon for *tumors of the colon and rectum*. This is about 0.22% of all admissions, a very low figure, which is remarkable and still unexplained in the geographical *pathology of Venezuela*. In that country, the population is six million, and cancer is the third important cause of death (8% of the annual total deaths). Other statistics elsewhere show that 97% of all intestinal tumors are malignant. In Venezuela, however, 48% of the colonic tumors were benign granulomas. Precancerous lesions are also very infrequent in the country, according to information given by a surgeon at the University Surgical Clinic of Caracas.

A *Congress on Medical Ethics* was held last November in *Buenos Aires*. The reports

of the congress are very impressive to read in the "Revista" (No. 12, Dec. 1958) of the Argentine Medical Association. The chief topics of the meeting were: the professional oath, medical responsibility, professional dignity, medical fees, secrecy, medical discretion, the duties of the physician toward the patients and toward his colleagues and the State, the relations of ethics to medical education, professional advertisement, and professional association. Another meeting on medical ethics took place last June in the form of *Round Table Discussions* which were organized, among others, by a group of the *Acción Católica Argentina*. The discussions of the June meeting were separately published.

The circumstances of the last (7th) *International Microbiological Congress*, which was held last year in Sweden, clearly proved the great progress that the science of bacteria achieved during the past 30-40 years. The last congress of microbiology had to be organized in 22 sections, and the proceedings of the sessions fill seven thick volumes. Microbiology has completely changed. Formerly, the microscopic germ was looked upon as a cell, a limited entity; now, it is still an entity, but it is a world in itself. The advances of the various methods of chemical and physical analysis, the electron microscope and the phase microscope proved that the bacteria have their own life phenomena, including sexuality, at least certain aspects of sexuality which cannot be found in any other living being. Let us add to all this the cytogenetic studies on bacteria, the study of the viruses and of the phages. Indeed, modern biology became *microbic* in the sense as modern physics became nuclear. Thus, microbiology is no more just the study of the microbe; it has become the *study of life itself* on the microbic object. How far will the microbic science progress by 1962, when the next (the 8th) international congress of microbiologists will be held at Montreal?

The *Ninth Edition of the British Pharmacopoeia*, which was issued in 1958, dropped a number of old-time remedies such as clove, quassia, fennel, the oils of lavender and of

lemon, and of bitter almond as well as such old favorites as licorice powder and rhubarb. The existence of penicillin for the treatment of lues has also played havoc with the previous *antisyphilitic* remedies such as sulfarsphenamine, neoarsphenamine, and other types of the salvarsan (Ehrlich-Hata's "606"!), also with the many bismuth salts for injections as well as with all the mercurials. Since the 16th century, when syphilis became known to Mankind, mercury had been held an essential part in the treatment of venereal disease. Now, nothing is left by the conservative British from the mercurials (not even calomel), except yellow oxide and ammoniated mercury, and mersalyl as a diuretic, and two mercurial fungicides. The local antibiotics are no more made with penicillin. The older *antileprotics* such as the oil of Chaulmoogra and of *Hydnocarpus* are also eliminated by their more modern ethyl esters. Sulfonamide and sulfathiazole are dropped in favor of sulfamerazine. Of the many recently produced *tranquilizer drugs*, the British have officially accepted only reserpine and chlorpromazine (or largactil). Carbon tetrachloride as an anthelmintic was also dropped in favor of the piperazine salt known as Antepar. The number of *galenicals* (tinctures, infusions, spirits, emulsions) continues to decline while the tablet and injectional forms are on the increase. But the British doctor can still officially prescribe "Conc. Co. Inf. Gent.," which is the abbreviation accepted for "Concentrated Compound Infusion of Gentian. . . ."

A Dutch ship, by the name of *De Hoop* (the Hope) has been rearranged to serve a fleet of Dutch fishermen in a dual capacity—as a church and as a hospital. A small chapel is aboard the ship in which fifty persons can attend every Sunday services of their particular denomination. As a hospital, the ship has an outpatient ward, and a hall with 12 beds, also a room for the isolation of communicable diseases, an operating room and a small pharmacy. The ship had its first cruise toward the island of Lofoten when for nine weeks it had been following a fleet of Norwegian fishermen catching cod. During the

cruise, 860 sick persons were treated aboard *De Hoop*.

Last September, at the *Lisboa meeting of malaria experts*, it was mentioned that one of the difficulties in the world-wide malaria fight arose in the case of nomads such as the Bedouins or the Indian tribes along the Amazon, or migrant workers and groups of people usually dispersed (laborers, wood cutters, fishermen) who were living in tents and in temporary shelters. One way of protecting such groups from malaria is by means of medicated salt. This method of malaria prevention was first recommended by Pinotti who suggested a mixture of common household salt with antimalarial drugs. *Pinotti's method* has been tried and tested for many years in Brazil, in the U. S., and in several countries of Africa.

Very few are the medical memoirs written about the 1944/45 *partisan fight in Yugoslavia and Montenegro* when many young boys and girls made difficult the retreat of the Nazi German Army from Greece toward Sarajevo. A doctor (Hannes Merbeck) who was the head of a *Swiss Surgical Mission* which rendered medical service to the third division of the Second Army Corps of partisans recently described—in the German language—his experiences in the winter of 1944/45, and showed the important role which his "flying" mobile surgical unit played during the heroic fight. In support of partisan fights, a surgical detachment must be very mobile, and it must have only a minimum of personnel at its disposal. Success of such a small medical team will entirely depend upon the observance of asepsis at all times, the cooperation of commander and surgeon, and the recognition that the classification of the wounded (the "triage") and the problem of their transportation and evacuation is at least as essential to success as the purely surgical work of the team.

At the Military Medical Academy's clinic at *Beograd*, more and more frequent are the cases of so-called "*juvenile hypertension*," without any evidence of a congenital or acquired disease that could be blamed for the elevation of blood pressure. Yugoslav mili-

tary surgeons think that some factors in the *military environment* may be responsible for this special type of hypertension which will easily disappear without any medication after a few days of bedrest, or under the influence of sedatives. It has been noted also that the condition could become difficult to deal with if left unattended.

In *Obando*, which is near Manila, the Tagalogs still adhere to *some old beliefs* in matters of conception, birth, life, and death. Thus, it is thought that, if a pregnant woman admires an image very much, her child may assume the features of the imaged person or saint. Pregnant women should never eat twin bananas unless they wanted to have twin babies. During the last weeks of pregnancy, the sex of the baby is thought to be predictable in many ways. The baby is a boy if the mother's belly is sharply protruding; a softly rounded belly shows the presence of a baby girl. The *afterbirth* is placed inside a coconut dipper which has been lined with ashes. The dipper, covered with ashes, is stored at the back of the cooking hearth where it remains for two months; then, it is buried in the ground (under the house). In case of sickness, an "*arbularyo*" (herb doctor) is called to examine the sick. Adults' ailments will be invariably classified as one of the following three: *hangin*, caused by bad winds; *pasma*, caused by exposure to wind and moisture after physical exertion, and *kulam*, caused by witchcraft. Any internal pain could be any one of the three. The herb doctor can also recognize consumption, beriberi, smallpox, and malaria. For all ailments, herbs are prescribed, but cases of "kulam" are referred to a "specialist" witch doctor. Infant mortality is very high. A woman may bear 10-12 children but she is lucky if 2-3 will survive.

The prevention of *diseases in Bulgaria* becomes more and more the dominant element of medical service, according to the socialistic organization of the public health affairs. Numerous health posts were erected which carry on the fight against infectious epidemics, against malaria and intestinal worms, and supervise the hygiene of settlements, of the

food industry and marketing places. The *preventive vaccinations* are done in the polyclinics and dispensaries. All types of modern immunizations are performed throughout the entire year. The last advancing step in this respect is the polio vaccination of 350,000 children which occurred in 1957/58. It should be mentioned also that during last year more than two million young persons (of a total population of 7,600,000) were given BCG vaccinations against tuberculosis. For the able tuberculous patients, and for the workers who become sick, *night sanatoriums* and night preventoriums are available in many industrial plants and mining works. In all other plants and communities, such people will receive a good main meal (at noon) at greatly reduced prices for a period of three or more months. A *dietetic kitchen* is also ready for the workers for a couple of months at reduced prices.

Nation-wide examinations in *Bulgaria* showed that in this Balkan country *goiter* is an endemic disease, especially in the counties situated in high mountainous regions where goiter sometimes reaches more than 50% of the inhabitants. The wide-spread endemicity of goiter requires an organized fight and a wholesale prevention by the use of iodine. As the first step, several endocrinological dispensaries were opened in the affected areas. Bulgaria again reported a few cases of *epidemic hemorrhagic fever* which occurred in the mountainous parts of the Sliven region. The five patients who were treated in the Sliven Hospital showed the typical clinical picture of epidemic hemorrhagic fever, with the well-known urinary findings. All of them worked at the same mining project where they came in contact with wild and domestic rodents (rats and mice).

Ankylostomiasis (hookworm disease) is a serious threat in several Eastern Mediterranean countries. The infestation is particularly heavy in certain parts of *Syria*, especially in the coastal strip and along the banks of the rivers Orontes and Euphrates. An Egyptian parasitologist made a survey of the disease in *Syria*, and in a frontier district of *Iraq* where 59% of the boys and 27% of

the girls harbored the worm. The survey was chiefly confined to school children because adult men are reluctant to give samples of their stools, and women are not asked for reason of decency. The parasitologist found that in many of the schools where he examined the children 85% to 100% of them were suffering from hookworm disease. Of course, it occurs only in areas where proper latrine facilities are not provided, and where people *habitually go about barefoot*. This is the case in the rural areas of *Syria* where 75% of the population is living. A simple measure to control the spread of hookworm disease would be a law which would *compel the natives to wear sandals* of some form out of doors.

The curiosity of medical men is infinite, and thus the field of medical research is ever expanding, devouring all sorts of peculiar objects. Now a hygienist of the *Tokushima University Medical School* has begun to study the influence of pillows upon the human body. Of course, he used the common *Japanese "sobagara" pillow* in his studies. He made a contraption by which the pillow could be heated and/or cooled. People—he found—who had cold feet would get to sleep easier with their heads on a warm pillow than on a cool pillow, and vice versa. Hot-footed persons preferred cool pillows to lie upon. There was also some correlation between the temperature of the skin of the sleeper and of his pillow. The height of the pillow is also of some importance for comfort. The comfortable height varies between 8 cm and 13 cm. The pillow's height also influenced the blood pressure, the heart rate, and the form of the electrocardiogram. The quality of the pillow (whether "sobagara" or porcelain or cane or water) will determine whether people feel warm or cold on their forehead and nape. (NOTE: Someone somewhere wrote an article on "useless" research. Could the "sobagara" serve as an illustration for deviations of science?)

Interesting experiments were carried out at *Nantung* where the *trichomonas infection* of female workers at the Daseng Cotton Mill was successfully treated with plant germi-

cides. Originally, the idea of such treatment was born in 1951 at the Leningrad Gynecological Institute. Various plant juices were used such as the juice from onion, ginger, turnip, and from the plants of *Gleditsia glauca* and *Lychnia* (the latter two were used in macerations). The most effective (100% success) was the *undiluted turnip juice*, especially when used in combination with previous flushings of the vaginal tract with 1% acetic acid. Ten to fifteen treatments were required only. The turnip juice had to be prepared fresh every day. For the cure of trichomonas infection of the urinary bladder, washing with a 4% boric acid solution was very effective. All cases were followed up for three months after cure. (Note: A part of the current Russian microbiological research is directed at the study of the bactericide (antibiotic) effect of the undiluted juices squeezed out from the roots of various plants. Thus, at the Kiev State University, it has been detected that the *root juice of leguminous plants* (such as clover and lucerne) is active *against the tuberculosis bacillus*).

The ugliest method of *Communist propaganda* can be read nowadays on the pages of the *Chinese Medical Journal* where authors use every opportunity to attribute the improved sanitary conditions in the country to "Party Leadership" and to "the Party secretaries taking direct command." Discussing the conditions of parasitic diseases in China, this journal wrote in English in the following manner: "Countless facts have proved that politics can treat diseases, that Marxism can save people, and that Party Leadership and political guidance are the decisive factors in the victory over parasitic diseases" (see p. 528 of Dec. 1958 issue).

"Tell me the *length of your cigarette butt*, and I shall tell you how soon you die from lung cancer!" One is almost tempted to make the conclusion from the available statistics that people who tend to throw away their cigarettes after a few puffs run less risk of lung cancer and will live longer than those who leave a cigarette butt less than 2 cm in length. Statisticians who collected discarded

butts from ashtrays in the United States and in England found that American butts were longer (about 3 cm in length) and British butts were shorter (18.7 mm the average). Such *national habits* may greatly influence the national exposure to any carcinogen in the cigarette smoke.

The occasional "*blackout*" of *trumpet players* when they are blowing high loud notes for more than a few seconds, can be easily understood when we consider the blowing of an instrument as a sort of *Valsalva maneuver* whose circulatory effects result in an inadequate cerebral flow of blood. A trumpet player may often produce a 160 mm Hg intrathoracic pressure. An oboe player only reaches 60 mm Hg occasionally. (In parenthesis: well-built males are able to produce 200 to 450 mm Hg intrathoracic pressure by violent coughing.) (Note: A similar curious phenomenon, explainable also by the circulatory disorder during a Valsalva maneuver, is reported that some persons will *faint after urination*. This is also explained by the sudden rise and immediate sudden fall in the blood pressure. Actually, most men perform a Valsalva trick at the beginning and at the end of their micturation.)

The people of Red China and their communist leaders do everything to get away as far as possible from Western culture. A step in this direction is the increasing ardor to place the ancient *traditional Chinese medicine* upon a high pedestal. Chinese people are therefore eager students of their own medical history, and they revive such famous persons as *Hua T'uo*, the father of surgery who lived in the third century A.D. This surgeon is said to be the inventor of anesthesia, and an *apostle of systematic physical exercise*. He used to say that "the used doorstep never rots, the same with the body." His system of exercise is named the "*frolics of the five animals*," which are the tiger, the deer, the bear, the monkey, and the bird. If we become accustomed to twist and to sway our body and to move our joints as these five animals do, we shall be cured of the diseases, we shall strengthen our limbs, and ensure a lasting health. . . . *Multa paucis!*

NOTES

Timely items of general interest are accepted for these columns. Deadline is 3rd of month preceding month of issue.

Department of Defense

Ass't Secretary (Health & Medical)—HON. FRANK B. BERRY, M.D.
Deputy Ass't Sec'y—HON. EDW. H. CUSHING, M.D.

SELECTIVE SERVICE

The Department of Defense has requested the Selective Service System to provide Armed Forces Induction Stations with 6,000 men during June 1959 for assignment to the Army.

MEDICARE

Medicare officials remind dependents of uniformed services personnel that Medicare is a "full service" program. A physician participating in the program agrees that, for any item of authorized care provided, he will accept the amount payable by Medicare as payment in full, except for that portion which is the responsibility of the dependent or sponsor under Medicare regulations.

Inquiries from dependents and sponsors received by the Office for Dependents' Medical Care indicate that some physicians are requesting additional fees for medical or surgical procedures that have been paid or are being paid for by Medicare.

Dependents who obtain care from civilian physicians under Medicare should not make any payment to the physician unless the charge covers either (1) an amount that is the responsibility of the dependent or sponsor under the Program or (2) is for an item

of care not authorized under the current program.

MEDICAL SCIENCES ADVISERS

The Department of Defense Advisory Council on Medical Sciences, a council which places emphasis on research and development, is chaired by Dr. Richard A. Kern of Temple University School of Medicine, second vice-president of our Association.

Recently named as a member was Dr. L. Eugene Daily, vice-president of Eaton Laboratories Division of the Norwich Pharmacal Company. Dr. Daily is chairman of the Sustaining Membership Section of our Association this year.

Army

Surgeon General—MAJ. GEN. LEONARD D. HEATON
Deputy Surg. Gen.—BRIG. GEN. THOMAS J. HARTFORD

PORTRAIT OF GENERAL HAYS

A portrait of Major General Silas B. Hays was unveiled at a formal dinner dance given recently by the Women's Club, Army Surgeon General's Office, in honor of General and Mrs. Hays.

This portrait has taken its place along with those of former Surgeons General of the Army in Sternberg Auditorium, Walter Reed Army Medical Center, Washington, D.C.

GENERAL COONEY TO EUROPE

Major General James P. Cooney who has just finished a four year term as Deputy Surgeon General of the Army has been assigned to Headquarters, U. S. Army Europe, as Chief Surgeon. He succeeds Major General Alvin L. Gorby.

General Cooney is a native of Iowa and received his medical degree from the University of Iowa in 1927. In August of that year he entered the Army Medical Service. In the years following he has achieved distinction as an authority on Radiology and Atomic Medicine. He was one of those who were chosen for the special mission to Japan to study the A-bomb survivors at Hiroshima and Nagasaki. Other important assignments requiring this expert knowledge were given him in the years that followed. In May 1953 he became Commandant of the Army Medical Service School at Fort Sam Houston, Texas, a position he was holding at the time he was appointed as Deputy Surgeon General.

General Cooney is a Fellow of the American College of Chest Physicians, Diplomate of the American Board of Radiology, a Fellow of the American College of Radiology and a member of the Radiological Society of North America. He is a vice-president of the Association of Military Surgeons.

TO BECOME DIRECTOR, NLN

Colonel Inez Haynes, ANC, Chief of the Army Nurse Corps, will become Director of the National League for Nursing upon her retirement September 1, 1959.

Her office will be at the headquarters of the League: 10 Columbus Circle, New York, N.Y.

TO WEST BERLIN

Colonel Charles H. Gingles, MC, who has been assistant for personnel on Dr. Berry's staff in the Pentagon has been assigned to West Berlin as commanding officer of the U. S. Army hospital.

ASSIGNMENT TO SGO

Lt. Colonel Clarence E. McKeown, MSC, has been appointed Chief, Armed Services Medical Regulating Office, Office of the Surgeon General. In this position he will be concerned with the evacuation and transfer of individual patients between commands and with patients returned from overseas.

Colonel McKeown entered the Army in

1941 and served with station and field type hospitals in France and Germany from 1942 to 1947. During the Korean Conflict he served with the Third Infantry Division.

ASSUMES NUCLEAR MEDICINE POSITION

Colonel John H. Rust, U. S. Army, Retired, has been appointed chairman of the newly established Section on Nuclear Medicine at the University of Chicago's School of Medicine.

A native of Louisiana, he was granted a doctor of veterinary medicine degree at Kansas State University in 1932. He received a commission in the Veterinary Corps Reserve of the Army in 1933 and in the Regular Army Veterinary Corps in 1935 and served until November 30, 1958 when he retired and joined the Massachusetts Institute of Technology.

Dr. Rust holds a doctor's degree in pharmacology from the University of Chicago (1956) and prior to that time did postgraduate work in radiobiology at Duke University. He is an expert of fission product metabolism and radiation injury.

TRAINING OVERSEAS

Our military medical personnel in overseas commands are enjoying very friendly relations with the medical people of the lands in



USCAR Photo

DR. SEITETSU HOKAMA, an internal medicine specialist of Okinawa, examines a patient in a U. S. Army hospital in Okinawa. DR. JAMES WATSON is on the staff of the hospital.

which our troops are stationed. There has been mutual benefit. Our personnel have been able to study some of the diseases that otherwise could not have been studied first hand; in the case of the native medical personnel an opportunity has been afforded to get acquainted with medicine as practiced in America without leaving their native country.

Here we see an example of this mutual understanding. This picture comes from Okinawa where American troops are stationed.

ARMY AND NAVY HOSPITAL

Bills have been introduced in Congress to give the Army and Navy Hospital, Hot Springs, Arkansas, to the State of Arkansas. For a number of years the Army has sought to close this hospital as it has been considered uneconomical for the military services.

HOW TO AVOID OBESITY

At the recent annual dinner for retired medical personnel of the Army held at Walter Reed Army Medical Center, Dr. George Heaton, brother of Major General Leonard Heaton, was the speaker. Mrs. Merritte Ireland, wife of the late Surgeon General of the Army, was one of the honored guests and seated next to Dr. Heaton. She proposed this to Dr. Heaton as an anti-obesity measure: "One should become a good conversationalist."

We should like to add that Dr. Heaton has apparently been following this advice for a number of years.

Navy

Surgeon General—REAR ADM. BARTHOLOMEW W. HOGAN

Deputy Surgeon General—REAR ADM. BRUCE E. BRADLEY

RETIRED

Rear Admiral Irwin L. V. Norman, Medical Corps, a vice-president of our Association, was placed on the retired list of officers of the U. S. Navy on May 1 after more than 31 years of active naval service.

A native of Willmar, Minnesota, he attended the University of Minnesota for his academic and medical training and received his Doctor of Medicine degree in 1927. Following graduation he entered the Navy and was assigned to the U. S. Naval Hospital, Chelsea, Mass., where he completed his internship training. At the outbreak of World War II he was Assistant U. S. Naval Attache, American Embassy, London, where he remained until April 1942. Later that year he was assigned to the SEVENTH Fleet in the Pacific area. His most recent assignment has been that of Inspector General of Medical Department Activities, Bureau of Medicine and Surgery, Washington.

Admiral Norman has assumed the position of Medical Director of the Chase Manhattan Bank, 18 Pine Street, New York.

Rear Admiral John Q. Owsley, Medical Corps, U. S. Navy, was retired from active service on May 1, 1959.

He was a native of Nashville, Tennessee, and after his graduation from Vanderbilt University in June 1924 entered the Medical Corps of the Navy. On April 1, 1949 he was promoted to the rank of Rear Admiral. During World War II he served as Senior Medical Officer of the USS *Enterprise* and as such participated in major campaigns in the South Pacific War Area, including operations in Guadalcanal, Midway, Santa Cruz, and Stewart Islands.

Admiral Owsley's last assignment was Inspector of Naval Medical Activities, Pacific Coast Headquarters, Western Sea Frontier, San Francisco.

Captain John F. Foertner, Medical Corps, U. S. Navy, who has completed more than 22 years active service in the Navy, retired on May 1. His last assignment was Executive Officer and Chief of Radiology at the Naval Hospital, Pensacola, Florida.

Captain Herman A. Gross, Medical Corps, U. S. Navy, who had completed 30 years in the Medical Corps of the Navy retired on May 1. His last assignment was Commanding Officer of the U. S. Naval Dispensary, San Francisco, Calif.

Captain Thomas M. Manley, Medical

Corps, U. S. Navy, retired on May 1, after 17 years active service. His last assignment was at the Naval Air Station, Minneapolis, Minn.

Captain George N. Raines, Medical Corps, U. S. Navy, was retired on May 1, after more than 28 years active service. His last assignment was Head Neuropsychiatry Branch, Bureau of Medicine and Surgery.

Captain William R. Whiteford, Medical Corps, U. S. Navy, closed out a naval career of more than 30 years. He retired on May 1. His last assignment was at the Naval Station, Long Beach, Calif.

Commander G. Stanley Hall, Medical Service Corps, U. S. Navy, who completed more than 30 years active naval service, was retired on May 1. His last assignment was Medical Administrative Officer, Naval Shipyard, Charleston, S.C.

Lieutenant Commander Gerald J. Willis, Medical Service Corps, U. S. Navy, after 30 years of active service, was retired on May 1. He last served as Chief, Personnel Records Division, Naval Hospital, Bremerton, Wash.

NURSE RETIRES

Commander Ann A. Bernatitus, NC, the first to receive the Legion of Merit Award in the U. S. Naval Service, was placed on the retired list on April 1 after more than 22 years active service.

A native of Exeter, Pennsylvania, she entered the service in September 1936. She was on duty in the Philippines at the time the United States entered World War II and "for courageous and outstanding performance of duty during the battles of Bataan and Corregidor" was awarded the Legion of Merit in the Fall of 1942.

JAPANESE SURGEON GENERAL VISITS NNMCM

Rear Admiral Yukioni Abe, Surgeon General of the Japanese Navy, who has been in the United States visiting medical facilities of the U. S. Navy, recently visited the National Naval Medical Center, Bethesda, Maryland.

He was welcomed to the Center by Rear

Admiral Thomas F. Cooper, the Commanding Officer.



U. S. Naval Medical School

Front row: (L to R) Capt. (now R. Adm.) F. P. Kreuz, MC, USN, Commanding Officer, U. S. Naval Hospital; Rear Adm. Yukioni Abe, Surgeon General, Japanese Navy; Rear Adm. T. F. Cooper, MC, USN, Commanding Officer, NNMCM; Capt. Ishida, Naval Attache, Japanese Embassy.

Back Row: (L to R) Capt. O. E. Van Der Aue, MC, USN, Commanding Officer, Naval Medical Research Institute; Capt. E. G. F. Pollard, DC, USN, Commanding Officer, U. S. Naval Dental School; Capt. L. J. Pope, MC, USN, Commanding Officer, U. S. Naval Medical School; and Commander C. F. Johnson, MSC, USN, Commanding Officer, U. S. Naval School of Hospital Administration.

HEALTH ENGINEERING UNIT

A new Health Engineering unit as an activity under the management control of the Bureau of Medicine and Surgery, has been established at the National Naval Medical Center, Bethesda, Md.

Commander Jacob Siegel, MSC, USN, has reported as the first Officer-in-Charge. He is a 1928 graduate of New York University and did graduate work in chemistry and engineering at Columbia University and the Brooklyn Polytechnic Institute. During World War II he was on duty with the Navy as an Industrial Hygiene Officer. He returned to active duty in 1950.

The mission of the unit is: "To provide technical and specialized services in the fields of operational toxicology and health engineering as related to toxicity problems en-

countered aboard ships and in the design and use of new weapons systems. Also, develop and provide biological data necessary for determining permissible limits so that precautionary measures, conducive to good health practices, may be prescribed."

FLU VACCINE

United States Navy and Public Health Service scientists have reported that a commercially prepared vaccine has proved 83 percent effective in preventing Asian influenza among a group of Naval recruits.

Results of the carefully planned study at the Great Lakes Naval Training Station also revealed that a multi-strain vaccine used earlier by the military—one not containing the Asian strain—also provided a modified degree of protection against the Asian type of influenza.

Dr. Benjamin F. Gundelfinger and W. T. Stille of the United States Navy, and Dr. Joseph A. Bell of the National Institutes of Health described their findings in a recent issue of the *New England Journal of Medicine*.

Air Force

Surgeon General—MAJ. GEN. OLIVER K. NIESS

Deputy Surg. Gen.—MAJ. GEN. OLIN F. MCILNAY

ASSIGNMENTS

Brig. General James Moore, USAF(MC), Surgeon, Air Training Command, Randolph Air Force Base, Texas, has been assigned as Commander, Lackland Air Force Hospital, San Antonio, Texas.

Brig. General M. S. White, USAF(MC), Director of the Directorate of Medical Staffing and Education, Office of the Surgeon General, Washington, D.C., will succeed General Moore as Surgeon, Air Training Command.

Colonel Fratis Duff, USAF (MC), has been assigned to Headquarters, U. S. Air Forces, Europe (APO 633, New York), as Deputy to the Surgeon, Brig. General H. H. Twitchell.

Colonel Harold V. Ellingson, USAF (MC) will succeed Colonel Duff as Commander, 3882 School Group, Gunter Air Force Base, Alabama.

MISSILE MEDICINE EXPERT

Colonel William G. Bradley, Surgeon of the U. S. Air Force Hospital at Selfridge Air Force Base, Michigan, has the distinction of becoming an expert in Missile Medicine and being promoted to colonel at the same time.

The promotion ceremony took place recently at Cape Canaveral, Florida, during a session of the course "Medical Aspects of Missile Operations," developed and conducted for senior Air Force, Army, and Navy Medical officers by Colonel George M. Knauf, Air Force Missile Test Center Staff Surgeon.

COLONEL LAY HONORED

The Outstanding Achievement Award was presented to Colonel Frances I. Lay, Chief of the Air Force Nurse Corps, by the University of Minnesota at the convocation commemorating the 50th anniversary of the School of Nursing on May 7, 1959. This award is presented to alumni who have attained high eminence and distinction.

Colonel Lay, a graduate of the General Hospital School of Nursing in Greenville, South Carolina, received her bachelor's degree in nursing education from the University of Minnesota in 1951. She entered the military service in 1939 and during World War II was Chief Nurse of the 160th General Hospital in Europe. During the Korean Conflict she served as a flight nurse in Korea. She was appointed Chief of the Air Force Nurse Corps in July 1956.

AVIATION MEDICINE COURSE

Sixty-seven military doctors, including 22 from allied nations, were welcomed to the nine weeks Primary Course in Aviation Medicine recently by Major General Otis O. Benson, Jr., Commandant of the School of Aviation Medicine, Randolph Air Force Base, Texas.

The senior member of the class is Lt. Colonel George E. Reynolds, 40, who besides his medical degree holds a Master's Degree in chemistry.

The youngest of the doctors in the class is 25-year-old Captain Frank W. Hayes who received his M.D. from Indiana University when he was 23 years old.

FLUORIDE TREATMENT

The School of Aviation Medicine at Randolph Air Force Base, Texas, recently completed the 1000th topical or surface application of a 10% stannous fluoride, in an evaluation aimed at measuring the effectiveness in preventing dental cavities. Captain John K. Custer, Aircraft Maintenance Staff Officer of the Air Training Command at Randolph, was the 1000th patient to participate in the program.

The Dental Sciences Division of the School, working jointly with Dr. Joseph C. Muhler, Indiana University, will compile data on 4,000 military subjects in determining the effectiveness of the agent. The evaluation, started in November 1958, will be completed in November 1960.

Two Dental Officers from the School, Lt. Col. Norman O. Harris and Lt. Col. Warren R. Hester examine all the patients, and the resultant data is processed by the School's Department of Biometrics.

At the completion of the experiment, Dr. Muhler will compile a final report on the effectiveness of this dental caries preventive treatment. If results confirm former laboratory and smaller clinical studies, the extensive use of a topical application of stannous fluoride will be indicated for all military and civilian patients.

AEROSPACE MEDICAL ASSOCIATION

Headquarters for the Aerospace Medical Association will be established in Washington, D.C., in the near future.

At its recent meeting in Los Angeles Dr. Ludwig G. Lederer, Medical Director of the Capital Airlines, was installed as president. Brig. General William J. Kennard, USAF (MC), Ret., was elected secretary-treasurer

and will be executive director of the new headquarters.

Captain Oran W. Chenault, Chief of Aviation Medicine, Bureau of Medicine and Surgery, Department of the Navy, Washington, D.C., was elected first vice-president.

Major General Oliver K. Niess, Surgeon General of the Air Force, was named to the executive council.

HOSPITAL ADMINISTRATION RESIDENCY PROGRAM

In fiscal year 1960 the U. S. Air Force Medical Service will establish nine accredited residencies in hospital administration at their hospitals. Medical Service Corps officers of the Air Force will be assigned to these hospitals as administrative residents to fulfill the academic requirements for a master's degree in hospital administration.

Public Health Service

Surgeon General—LEROY E. BURNET, M.D.
Deputy Surg. Gen.—JOHN D. PORTERFIELD, M.D.

NEW CATEGORY IN COMMISSIONED CORPS

The Health Services category has been added to the Commissioned Corps of the Public Health Service. This brings to 11 the number of professional groups that comprise the Commissioned Corps.

This new category includes health educators, nutritionists, medical record librarians, hospital administrators, medical social workers, and personnel in related health fields.

DIVISION CREATED

The Division of Water Pollution control has been created in the Public Health Service. The establishment of this division elevates the status of water pollution control activities. The chief of this new division, Gordon E. McCallum, will report to the Chief of the Bureau of State Services.

In addition to the creation of the new division there has been established the position of Associate Chief for Sanitary Engineering of the Bureau of State Services.

Secretary of Health, Education, and Wel-

fare, Arthur S. Flemming, has said, "If we are to move ahead successfully in the attack on water pollution, we must combine administrative, engineering, and technological skills at all levels of the government."

ASSIGNMENT

Assistant Surgeon General Mark D. Hollis has been appointed to the newly created position of Associate Chief for Sanitary Engineering in the Bureau of State Services. He will serve as staff adviser in connection with environmental public health programs. He will continue as Chief Sanitary Engineer Officer of the Public Health Service.

Wesley E. Gilbertson has been appointed by the Surgeon General as Chief of the new Division of Engineering Services, formerly the Division of Sanitary Engineering Services. This new division will be concerned with matters relating to milk and food sanitation, general engineering, engineering resources, the engineering aspects of community air pollution, and the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio.

PRESIDENT-ELECT APA

Dr. Robert H. Felix, Director of the National Institute of Mental Health, Bethesda, Maryland, has been elected as President-Elect of the American Psychiatric Association, the oldest national medical Association in North America. He will assume office in May 1960.

The APA was founded on October 16, 1844, as the Association of Medical Superintendents of American Institutions for the Insane with an original membership of 13 physicians. In 1892, with a membership of 250, its name was changed to the American Medico-Psychological Association. In 1921 it took its present title.

MEDICAL RESEARCH

Congress is definitely medical research minded. Instead of accepting the budget figures proposed by the administration larger amounts were recommended by Congress for

medical research. These funds will be under the supervision of the Public Health Service through its National Institutes of Health at Bethesda, Maryland. The total amounts to \$344,279,000 which is \$50 million more than the President asked for.

RESPONSE OF THE EOSINOPHILE

The response of the eosinophilic leukocyte in the circulating blood has been used in many studies as a convenient yardstick of the body's reaction to stress. It has been shown for example that a decrease in the number of eosinophils is associated with increased adrenocortical activity that accompanies a state of stress. National Institute of Dental Research (Bethesda, Md.) investigations now report on the use of such procedures in clinical studies of psychosomatic factors in oral disease.

Twenty-four adults with extensive dental caries were studied during the course of 235 dental appointments of 45 minutes duration by Dr. Irwin I. Ship.

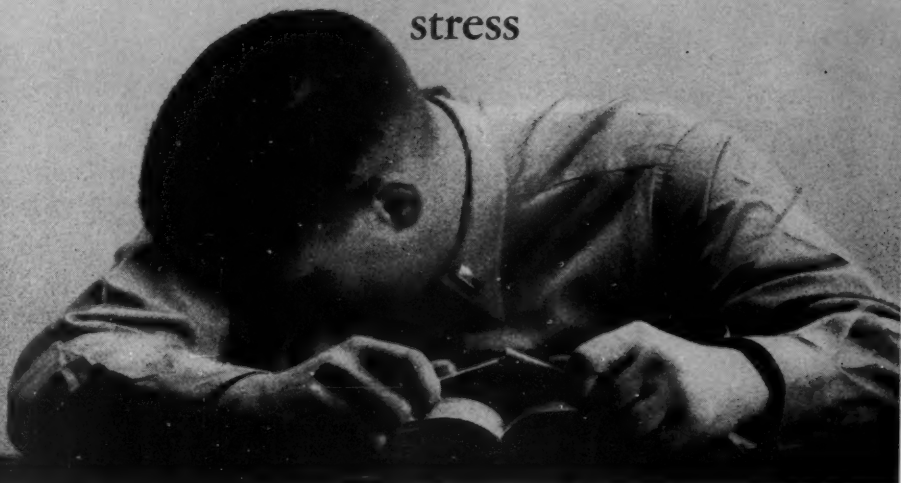
Categories of patient classification were made in accordance with the nature of the examination or operative procedure at any given appointment. These ranged from examination and interview to oral surgery.

Results showed that variation in stress between individuals was greater than in the same individuals, and variation between treatments was greater than during treatments. Adrenocortical activity varied directly with the magnitude of stress involved in the dental procedure. All procedures showed significant differences from control appointments. The eosinophil levels were not affected by local anesthesia or barbiturate premedication in any of the categories of treatment except oral surgery where administration of barbiturates was associated with a relative increase in the eosinophilic level.

STAPHYLOCOCCAL BACTERIOPHAGES

Preservation of staphylococcal bacteriophages by a freeze-dry method has been developed by Charles H. Zierdt, bacteriologist and co-workers at the Clinical Center, National Institutes of Health, Bethesda, Md.

for fast, effective
control of symptoms
in situational
stress



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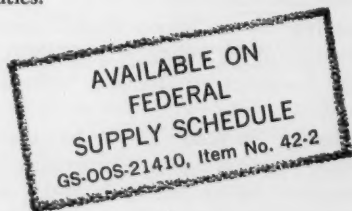
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leaders in psychopharmacology

The method will greatly assist hospitals in the employment of phage typing as a control measure for staphylococcus. Using this new method, pharmaceutical manufacturers or other large central laboratories now could supply preserved bacteriophages to hospitals where they may be stored until needed.

POISONING

The Public Health Service has completed an analysis of 4,000 cases of poisoning which came to the attention of local poison control centers between July 1956 and April 1958.

Ninety percent of the cases analyzed involved children with a large percent of them under five years of age.

It behooves parents to become more careful in the matter of allowing many items to get into the hands of children. It is not only the medicine cabinet that is involved, but also the dressing table, the dining room table, and the kitchen or the laundry. Insecticides, cosmetics, and cleaning items come in for their fair share in incriminating poisons.

Poison control centers have been set up in many areas. These must be available for call on a 24-hour, seven day week basis to be most effective. The National Clearing House for Poison Control Centers, established in 1957 as part of the Public Health Service in Washington, has been found to be of great assistance to these centers by keeping them informed on current matters pertaining to poisons.

CEREBRAL PALSY

Cerebral palsy, mental retardation, and kindred defects in children will be studied intensively for the next six years by the National Institute of Neurological Diseases and Blindness of the Public Health Service's National Institutes of Health, Bethesda, Maryland.

Dr. Burney, Surgeon General, has stated that this is the first research program ever undertaken to collect and analyze this information *before* rather than after such disorders develop.

A total of 16 hospitals and universities of

the country and 40,000 women will be involved in this study which will require careful record keeping of doctors and mothers from the period of pregnancy to at least the sixth birthday of the child. Standardization of the data will be insured because of the preliminary preparation for the areas to be recorded and studied.

AMERICAN INDIAN HEALTH

In the latter part of 1955, the Public Health Service was charged with the medical care of the American Indian and the Alaska Natives (Eskimos, Indians and Aleuts). It was recognized for a long time that the most prevalent disease among these people was tuberculosis.

While that disease had yielded to control measures in other peoples of the United States, among the Indians and Alaska Natives no such reduction in rate had been noted. The reasons are many, some of which are due to customs of these natives, language difficulties, lack of appreciation of sanitation, close family and tribal ties, dispersion of settlements which made approach to them by doctors and nurses extremely difficult.

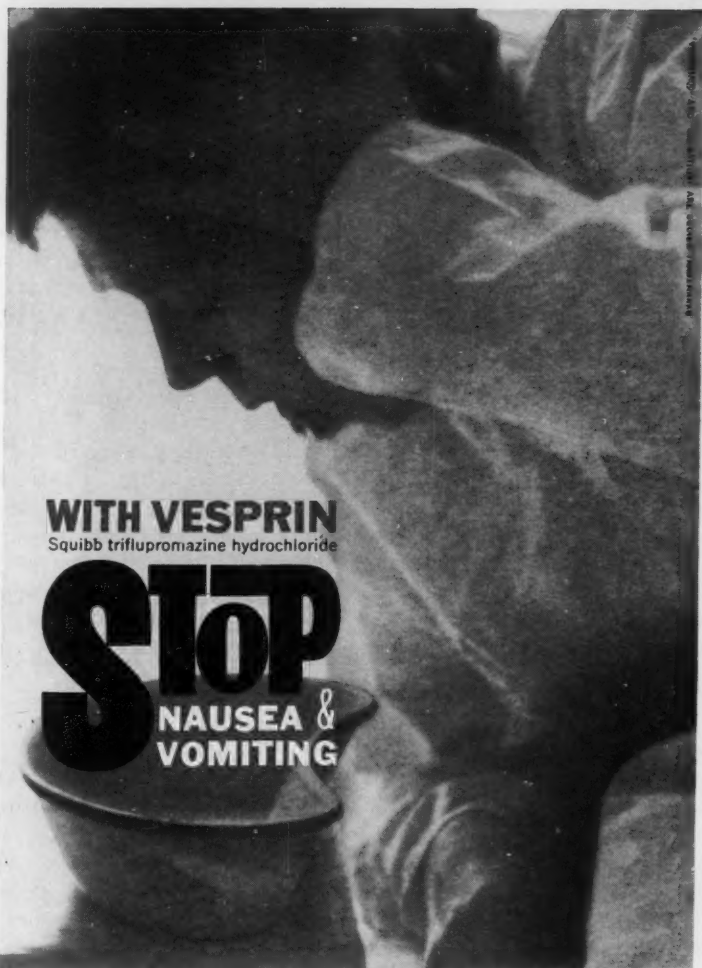
Recent reports show that progress is being made and tuberculosis now ranks eighth as the cause of death among Indians and fifth among Alaska Natives. New cases have dropped 25 percent among Indians and about 33 percent among the Alaska Natives.

While inroads have been made the task ahead is still enormous.

HOSPITAL FOR INDIANS

A 200-bed U.S. Public Health Service Hospital will be constructed at Gallup, New Mexico, to serve approximately 81,700 Indians living on or near the Navajo Reservation in Arizona, New Mexico, and Utah. Construction will be completed in late 1960.

Patients will be referred to the medical center from seven other Indian hospitals and about two dozen health centers and field stations in the area. A special feature of the hospital will be a large outpatient department and field health unit.



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Dosage: Intravenous, 5 to 12 mg. / Intramuscular, 5 to 15 mg. / Oral prophylaxis, 20 to 30 mg. daily / **Supply:** Tablets, 10, 25, and 50 mg., bottles of 50 and 500 / Emulsion, 30-cc. dropper bottles and 120-cc. bottles (10 mg./cc.) / Parenteral Solution, 1-cc. multiple dose vial (20 mg./cc.) / 10-cc. multiple dose vial (10 mg./cc.) / Vesprin Injection Unimatic (15 mg. in 0.75 cc.)

Vesprin/the tranquilizer that fills a need in every major area of medical practice/anxiety and tension states, pre- and postoperative tranquilization, alcoholism, and obstetrics.

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Veterans Administration

Chief Medical Director—WILLIAM S. MID-
DLETON, M. D.

Deputy Chief Med. Dir.—R. A. WOLFORD,
M.D.

VETERAN STRENGTH

The number of veterans in civil life at the end of March was estimated at 22,699,000 as against the number at the end of February (22,709,000). Two-thirds of the losses are among the World War I veterans, most of which are over 60 years old.

APPOINTMENTS

Dr. Thomas M. Arnett has been appointed a deputy director for planning in the Veterans Administration Department of Medicine and Surgery in Washington.

During World War II he served in the Army Medical Corps and in 1947 was a resident in surgery at Walter Reed Army Hospital. He entered the Veterans Administration in November 1947 as director of professional services at the office in Atlanta, Ga.

Dr. Samuel L. Aspis has been appointed as manager of the VA hospital at Kansas City, Mo.

Dr. Aspis is a native of New York City and a graduate of Middlesex Medical School. He served with the Army in World War II after which he joined the Veterans Administration.

Russell C. Williams, a World War II blinded veteran, has been appointed as chief of the Veterans Administration Rehabilitation program for blinded veterans.

He has been chief of the rehabilitation activities for the blind at the Hines VA hospital since 1948.

A native of Auburn, Indiana, Mr. Williams was an athletic director and teacher at Dillsboro High School, Dillsboro, Indiana, prior to entering the Army in 1942. In August 1944 he was blinded by an exploding shell in France. He was a central figure in producing the training film, "The Long Cane," which has been distributed and shown

nationally to demonstrate techniques to rehabilitate the blind.

DR. CADY HONORED

The Veterans Administration Hospital, Houston, Texas, April 15, 1959, had its Decennial Celebration of affiliated operations with Baylor University College of Medicine. The Administrator of Veterans Affairs, Honorable Sumner G. Whittier, participated. During the morning hours "live" television included interviews, activities, and the formal ceremony. Included was the unveiling, by employees and volunteers, of a portrait by Guido Fulgnit of Dr. Lee D. Cady, the Manager.

At a staff dinner, honoring the Administrator, the Dean's Committee surprised Dr. Cady with an "Award of Merit for Administrative Skill . . . Educational leadership . . . Devotion to the welfare of citizens and community . . . and Significant Contribution to the Texas Medical Center through his dedication to academic medicine and dentistry, and support of the Deans Committee's development of sound programs of medical education and research."

ISONIAZID

Heredity comes into the picture of the blood level of isoniazid taken by mouth.

At the VA hospital in Salt Lake City Doctors Harris and Knight and M. J. Selin, bacteriologist, found that among Americans of Northern European ancestry about 50 percent have a relatively high level of the drug in their blood and the other 50 percent have relatively low levels when the drug is taken by mouth. Furthermore, all Americans of Oriental ancestry were able to maintain only low levels of the drug.

CYCLOSERINE

Test of the newer drug, cycloserine, as a companion drug to isoniazid in the treatment of tuberculosis, indicates that cycloserine is about as effective as PAS, a drug already in use for this purpose. The finding is based on the study of 732 Veterans Administration



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patients having tuberculosis with lung cavities.

BOOK AVAILABLE

VA Prospectus, Research in Aging is a book which sets forth the thinking of a group of the nation's medical leaders on the subject of aging. The book is available from the Sup't. of Documents, U. S. Government Printing Office, Washington 25, D.C.

HEART-LUNG MACHINE

Cardiac surgery has been aided by the use of a new method devised by Dr. Frank Golan, Veterans Administration Hospital, Nashville, Tenn.

Oxygenation, pumping, and refrigeration of the blood are combined in one small plastic cylinder in the new heart-lung machine, and by the use of this machine the permissible operating time can be prolonged. The machine has been used at Duke University and the Mayo Clinic recently.

Miscellaneous

APPOINTMENT

Dr. Charles G. Durbin, has been appointed as Veterinary Medical Director of the Food and Drug Administration's Bureau of Medicine. He succeeds the late Dr. John H. Collins.

In 1949 Dr. Durbin received the V.M.D. degree from the University of Pennsylvania School of Veterinary Medicine. He served in the U. S. Army Veterinary Corps during World War II and was in the European Theatre.

PHARMACEUTICAL MANUFACTURERS ASSOCIATION

William B. Graham, president of Baxter Laboratories since 1952 was elected chairman of the Pharmaceutical Manufacturers Association recently. This association is a merger of the former American Drug Manufacturers Association and the American Pharmaceutical Manufacturers Association.

Mr. Graham predicted that in the next ten

years the over-all industry sales will double—"This would increase sales of U. S. manufacturers to about \$4½ billion by 1969," he said.

Further, the "Backbone of this growth is research that accounts for about \$190 million of the industry's budget this year," Mr. Graham stated.

FOREIGN PHYSICIANS TAKE EXAMINATIONS

A number of foreign trained physicians taking the qualifying examination of the Education Council for Foreign Medical Graduates is rapidly increasing.

The Council aids graduates of foreign medical schools in establishing their qualification to assume internships or residencies in United States hospitals. There are overseas centers where these examinations can be taken and the number of these centers is increasing. A command of English is necessary.

Further information may be obtained by writing to the Council at 1710 Orrington Avenue, Evanston, Illinois.

PLEA FOR LABORATORY EQUIPMENT

At a recent luncheon held at the Mayflower Hotel, Washington, D.C., the first "Health U.S.A." Award was made to the Honorable Lister Hill of Alabama, one whom we all know in connection with health bills in congress and whom we particularly associate with the Hill-Burton legislation for construction of hospitals.

One of the speakers at this luncheon was Dr. Selman A. Waksman, Nobel prize winner for medicine and physiology in 1952. He made a special plea for appropriations by Congress for laboratory facilities in which research may be accomplished. It was his feeling that the need for such facilities is critical.

Dr. Waksman and his coworkers were the discoverers of streptomycin.

MEDICAL COURSE

A Summer Continuation Course of Instruction in Chronic Diseases will be given at the University of Minnesota on the Minneapolis campus under the direction of the



One 'Dexamyl' *Spansule* capsule, taken in the morning, controls your patient's appetite all day long and improves his mood—thus sustaining morale even when the dietary regimen is severe.

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SMITH KLINE & FRENCH LABORATORIES

School of Public Health, July 27 to August 22, 1959.

This is a non-academic credit program in chronic diseases on the graduate level for physicians in health agencies and for research workers in the medical sciences. The subjects to be covered are epidemiological methods in the non-infections diseases, advances in heart disease, cancer and the chronic diseases.

The faculty will include visiting physicians. For further information write to Dr. Leonard M. Schuman, School of Public Health, University of Minnesota, Minneapolis 14, Minn.

POSTGRADUATE COURSES

The Post-Graduate Medical School of the New York University-Bellevue Medical Center announces a few openings in graduate courses available during the 1959-1960 academic year. They may be taken as part of a residency program or in preparation for specialty board examinations.

Courses in the following fields are offered: ANESTHESIOLOGY, DERMATOLOGY AND SYPHILOLOGY, MEDICINE, ORTHOPEDIC SURGERY (January 1960), OTORHINOLARYNGOLOGY, RADIOLOGY, SURGERY.

Further information may be obtained from the Office of the Associate Dean, New York University Post-Graduate Medical School, 550 First Avenue, New York 16, N.Y.

PG COURSE

The American College of Gastroenterology will give a postgraduate course in gastroenterology at The Biltmore in Los Angeles, Calif., on 24, 25, and 26 September, 1959.

For further information and enrollment write to the American College of Gastroenterology, 33 West 60th St., New York 23, N.Y.

BIBLIOGRAPHIES AVAILABLE

The National Library of Medicine has just issued *Fungus Infections*, a bibliography on systemic and superficial fungus infections. This is another in its series of selective bibliographies on subjects of current interest.

Others in the series are on space medicine, cancer chemotherapy, and staphylococcal infections. A complete list of such bibliographies is available. Single copies of the bibliographies can be obtained at no cost upon request to the: Acquisition Division, National Library of Medicine, 7th Street & Independence Ave., S.W. Washington 25, D.C.

AMINO ACID BIBLIOGRAPHY

A ten-page bibliography describing possible pharmaceutical uses of the amino acid *Histidine* has been prepared by the General Mills Research Laboratories. A copy may be obtained free by writing to: Dep't. 33-154, General Mills Research Laboratories, 2010 East Hennepin Ave., Minneapolis 13, Minn.

BOOK REVIEW REPRINTS

A limited number of reprints of the "Book Reviews" that appeared in *MILITARY MEDICINE* in 1958 are available. Copies may be obtained on request by addressing the Association: 1726 Eye Street, N.W., Washington 6, D.C.

TABLET DISINTEGRATION APPARATUS

An inexpensive tablet disintegration apparatus that can be assembled for \$2 has been developed at The University of Arizona College of Pharmacy to replace costly commercial equipment that in the past has made disintegration time tests prohibitively expensive for pharmacy students.

Developers of the "do-it-yourself" pharmaceutical laboratory equipment are Dr. Jack R. Cole and Richard F. Childs, both of the UA pharmacy faculty. A report of their unusual apparatus will be published in the Summer, 1959, edition of the *American Journal of Pharmaceutical Education*. Title of their paper is "A Low Cost Tablet Disintegration Apparatus for the Undergraduate Pharmaceutical Preparation Laboratory."

The apparatus is designed to enable pharmacy students to test disintegration times for commercial and laboratory prepared tablets. Previously the equipment available was very costly, making the universal use of this test

procedure by all students prohibitive on the basis of the expense involved.

ANTIBIOTICS SYMPOSIUM

The Seventh Annual Symposium on Antibiotics will be held at the Mayflower hotel, Washington, D.C., November 4-6, 1959. September 14 is the last date that abstracts can be submitted and October 15 is the last date for manuscripts. Further information may be obtained by writing: Henry Welch, Ph.D., Director, Division of Antibiotics, Food and Drug Administration, Department of Health, Education, and Welfare, Washington 25, D.C.

MEETING

The American Association of Blood Banks will hold its Twelfth Annual Meeting on November 4-7, 1959, at the Edgewater Beach Hotel, Chicago, Ill. Further information may be obtained from the Secretary, 30 North Michigan Ave., Chicago 2, Ill.

MEETING

The Pan American Medical Association Congress will be held in Mexico City, May 2 to 11, 1960.

The Pan American Medical Association was organized in New York 34 years ago by a group of eminent physicians to fulfill the need for interchange of medical knowledge and research in the Western Hemisphere. They adopted as their credo: "The practice of medicine has no national, racial, or religious boundaries."

Information may be obtained by writing to Dr. Joseph J. Eller, Director General, 745 Fifth Ave., New York 22, N.Y.

GOITER CONFERENCE

The Fourth International Goiter Conference will be held July 5-9, 1960, in London, England, under the auspices of the London Thyroid Club and the American Goiter Association. The American Goiter Association plans to make available to worthy candidates a limited number of travel grants for participants of this meeting.

Application blanks are available from John

C. McClintock, M.D., 149½ Washington Ave., Albany 10, New York U.S.A.

Applications will be received until January 1, 1960.

Honor Roll

Since the publication of our last list, the following sponsored one or more applicants for membership in the Association:

Lt. Vernon N. Houk, MC, USN
Major Edward A. Barrett, MC, USAR
Capt. M. W. Rusher, MC, USN
Lt. Col. Bernard Aabel, MSC, USA
Harold J. Meier, M.D.

Lorris M. Bowers, M.D.

Dr. Allison E. Imler

Major William R. Bunge, MC, USA

Dr. Harry Weinrauch

Lt. Col. Phillip Bourland, MC, USAR

Asst. Surg. Gen. Lucile Petry Leone, US-
PHS

Capt. Bernard Struhl, DC, USA

Capt. Byron Gil Brogdon, MC, USAF

Col. Arthur H. Corliss, MC, USAF

Leonard I. Bluestone, M.D.

Capt. Sidney Brody, MC, USN

Major Donald H. Glew, Jr., MC, USA

Dr. Robert A. Milch

Med. Dir. Byron Olson, USPHS

Major Edward T. O'Dell, MC, USA

Col. Milton Greenberg, USAF-R

Col. Wilbur A. Smith, USAF-R

Capt. John H. Moore, MC, NY ANG

Irwin Walter Scopp, D.D.S.

It. J. E. Birmingham, MSC, USNR-R

Col. Robert B. Skinner, MC, USA

New Members

Lt. Cdr. LeRoy Fred Lundy, MC, USNR

1/Lt. Julian L. Glatt, MC, NY ANG

Major Robert Holland Quinn, MC, USA

Andre C. Kibrick, Ph.D.

Capt. Harld O. Walker, Jr., USAF
(MSC)

Capt. Edward V. Denneen, MC, USNR

Major William G. Kueker, MSC, USA

SA Surg. Earl Bonneau Rynerson, US-
PHS-R

Lt. Col. Roy C. Farr, USAF-R (MC)
SA San. Engr. Edward C. Rubin, US-
PHS-R

Major Thomas A. Hogan, DC, USAF-R
Cdr. Daniel Clarke Belden, MC, USNR
Capt. Paul Duboff, USAF (DC)

Lt. Col. Eugene R. K. Leiter, USAF
(MC)

SA Surg. Patrick B. Campbell, USPHS-R
Capt. J. W. Hickman, USAF Ret. (DC)

Med. Dir. Dudley A. Reerie, USPHS-R
Capt. Edna L. Noble, ANC, USAR

A. NO Georgia Etta Hughes, USPHS
Col. Anthony J. Della Rocca, MC, USAR

Sr. Surg. L. S. McLean, USPHS-R
(Inact.)

Col. Alfred L. Frechette, MC, Mass. NG
Maj. Edward C. Mattie, MSC, USA

Capt. Frank E. Edmunds, Jr., USAF
(MC)

Sr. Dent. Surg. Frank V. Coles, USPHS
Capt. Michael H. Dyer, USAF (DC)

SA Surg. Frederick Jordan, USPHS

Lt. Col. Roy E. Brooks, MSC, USA

Capt. Berton L. Dubois, DC, USAF

Deaths

BAKER, William J., Colonel, Medical Corps, AUS, Ret., died in Chicago, Illinois, December 3, 1958, at the age of 64.

Dr. Baker, a specialist in Urology, graduated from the Rush Medical College in 1925. He had maintained an office at 7 West Madison Street, Chicago 2, Ill.

BOWERS, James M., Lieutenant Colonel, Medical Corps, AUS, died at Seattle, Washington, February 9, at the age of 58. Death was due to a heart attack. He received his medical degree from the University of Michigan School of Medicine in 1925. During World War II he served at Harmon General Hospital, Longview, Texas, Camp Hulen, Texas, and the Army and Navy General Hospital, Hot Springs, Arkansas. Doctor Bowers was engaged in the practice of the specialty of Internal Medicine at 647 Stimson Building, Seattle, Washington.

CARNES, Edwin H., Sr., a retired Public

Health Service officer, died April 13 at Hartford, Conn., at the age of 61.

Since his retirement in 1956 from the Public Health Service after 32 years of duty, he had been chief of Connecticut's State Hospital Division. On a recent visit to the St. Francis Hospital, Hartford, he was stricken with a cerebral hemorrhage.

Dr. Carnes is survived by his wife, a son and a daughter.

GLEW, Donald H., Sr., a practicing orthodontist in Washington, D.C., died of a heart attack at his home, April 20. He was 58.

A native of Ottumwa, Iowa, he became a resident of Washington, D.C., in 1917. He was trained in dentistry at George Washington and Georgetown Universities, and graduated from the latter school in 1922. He had been a reserve officer in the Army Dental Corps, and during World War II was a member of the D.C. Selective Service Medical Advisory Board.

Doctor Glew is survived by his widow who resides at 3506 Macomb St., N.W., Washington, D.C., and his two sons, Major Donald H., Jr., and Dr. William B., both of Washington, D.C.

HANSON, Adolph Melanchton, Colonel Medical Corps Reserve, Retired, died January 15, 1959, at age 70, at Faribault, Minn.

A native of St. Paul, Minn., Dr. Hanson had graduated from Northwestern University Medical School in 1911. In 1933 the Minnesota State Medical Association awarded him a gold medal in recognition of his isolation of the parathyroid hormone. The confirmation of this discovery was made by the U. S. Patent Office in 1932.

Dr. Hanson was a veteran of both World Wars. During World War II he served with the Medical Field Service School at Carlisle, Pa., at Camp Barkely, Texas, and with the 76th Station Hospital in the Pacific area. He was author of a chapter in Volume XI of the Medical Department History of World War I, "Management of Gunshot Wounds of the Head and Spine." He had contributed many articles to medical literature.

HETRICK, Llewellyn E., Colonel, U. S. Army Medical Corps Reserve, Retired, died in Colchester, Conn., January 20, 1959, at the age of 83.

Dr. Hetrick, a native of Lancaster, Pa., received his medical degree from Hahnemann Medical College and Hospital in 1898. He was a life member of the American Academy of Ophthalmology and Otolaryngology and a Fellow of the American College of Surgeons.

During World War I he served with the U. S. Army Medical Corps, after which he became very active in the Reserve Medical Corps and was retired in 1955. During World War II he was active as an examining physician for the Selective Service. He

had made his home in Hampton, Conn.

ZABRISKIE, Edwin Garvin, died at the Columbia Presbyterian Medical Center, New York City, January 13, 1959, at the age of 84.

Dr. Zabriskie was a native of Flatbush, New York. He received his medical degree from the State University of New York College of Medicine at New York City, Brooklyn, in 1897. He had specialized in mental and nervous diseases and had served in the Army Medical Corps in World War I. During World War II he was a consultant to the Surgeon General of the Army. In 1947 he was awarded the Alumni Medallion of his alma mater for distinguished service to American Medicine.



NEW BOOKS

Books may be purchased through the Association.

- Clinical Interpretation of Laboratory Tests*, Raymond H. Goodale, M.D., F. A. Davis Company, Philadelphia, Pa. Price \$8.75.
- Manual of Chest Clinic Practice in Tropical and Sub-Tropical Countries*, A. J. Benatt, M.D., The Williams & Wilkins Co., Baltimore, Md. Price \$3.00.
- The Mammals of North America*, E. Raymond Hall, Ph.D., and Keith R. Kelson, Ph.D., The Ronald Press Co., New York, N.Y. Price \$35.00. (2 vol. set)
- Pathology*, Peter A. Herbut, M.D., Lea & Febiger, Philadelphia, Pa. Price \$18.50.
- Biosynthesis of Terpenes and Sterols*, Ciba Foundation Symposium, Editors G. E. W. Wolstenholme, O.B.E., M.A., M.B., B.Ch. and Cecilia M. O'Connor, B.Sc., Little, Brown and Company, Boston, Mass. Price \$8.75.
- Navy Surgeon*, Rear Admiral Lamont Pugh, Medical Corps, United States Navy, Retired, J. B. Lippincott Company, Philadelphia, Pa. Price \$5.00.
- Fundamentals of Otolaryngology*, Lawrence R. Boies, M.D., W. B. Saunders Company, Philadelphia, Pa. Price \$8.00.
- Immunity and Virus Infection*, Edited by Victor A. Najjar, John Wiley & Sons, Inc., New York, N.Y. Price \$10.50.
- Science and Psychoanalysis*, Volume II, Individual and Familial Dynamics, Edited by Jules H. Masserman, M.D., Grune & Stratton, Inc., New York, N.Y. Price \$6.75.
- Joslin's Treatment of Diabetes Mellitus*, New 10th Edition, Lea & Febiger, Philadelphia, Pa. Price \$16.50.
- Leprosy in Theory and Practice*, Edited by R. G. Cochrane, M.D., Ch.B. (Glas.), F.R.C.P. (Lond.), D.T.M. and H., The Williams & Wilkins Co., Baltimore, Md. Price \$15.00.
- Orthopaedic Nursing*, Mary Powell, S.R.N., M.C. S.P., The Williams & Wilkins Co., Baltimore, Md. Price \$6.50.
- Progressive Exercise Therapy in Rehabilitation and Physical Education*, John H. C. Colson, F.C. S.P., M.S.R.G., M.A.O.T., The Williams & Wilkins Company, Baltimore, Md. Price \$4.50.
- The Preservation of Eyesight*, Sir Arthur Salusbury MacNalty, K.C.B., M.A., M.D., (Oxon.), F.R.C.P. (London), F.R.C.S. (Eng.), D.P.H. Hon. F.R.S. (Edin.), The Williams & Wilkins Company, Baltimore, Md. Price \$3.00.
- The Szondi Test in Diagnosis, Prognosis and Treatment*, Lipot Szondi, M.D., Ulrich Moser, Ph.D., Marvin W. Webb, A.M., Ed.D., J. B. Lippincott Co., Philadelphia, Pa. Price \$12.00.
- Care of the Patient with a Stroke*, Genevieve Waples Smith, R.N., Springer Publishing Co., Inc., New York, N.Y. Price \$2.75.
- Sociology and the Military Establishment*, Morris Janowitz, Russell Sage Foundation, New York, N.Y. Price \$1.50.
- The Air Force Blue Book*, Tom Compere, editor, Military Publishing Institute, Inc., New York, N.Y. Price \$1.00.



BOOK REVIEWS

CURRENT THERAPY—1959. Latest Approved Methods of Treatment for the Practicing Physician. Edited by Howard F. Conn, M.D. 781 pp. W. B. Saunders Company, Philadelphia and London. Price \$12.00.

"This volume marks the beginning of the second decade of publication of *Current Therapy*." A book that has survived annual revisions and improves with each edition speaks for itself.

Over 300 contributors have played a part in preparing this work. The treatment of diseases is given briefly and completely.

After the diagnosis is made turn to *Current Therapy* for authoritative treatment.

THE ARMY ALMANAC. Edited by Brig. General Gordon Young. 797 pp. The Stackpole Company, Harrisburg. Price \$8.95.

Only by exhaustive, painstaking work on the part of many persons could such a tremendous book of facts on the Army be published. Facts are included for those periods from the inductee to the veteran; from the Army in the colonial days to the present atomic Army.

Those who need factual information about our Army will be handicapped without this almanac; many others will want to refer to it from time to time for its authoritative accounts about the wars, organization, decorations, divisions and myriad other items about the U. S. Army.

THE BRAIN AND HUMAN BEHAVIOR. Proceedings of The Association for Research in Nervous and Mental Disease. Edited by Harry C. Solomon, M.D.; Stanley Cobb, M.D., and Wilder Penfield, M.D. 564 pages, 200 illustrations and 53 tables. The Williams & Wilkins Company, Baltimore. Price \$15.00.

This volume, No. 36 in a continuous series of annual Proceedings (except for 1945), is a record of the Association's meeting of December 7 and 8, 1956. It contains 21 papers, and is produced under the able editorship of Drs. Harry C. Solomon, Stanley Cobb, and Wilder Penfield. As in all the previous Proceedings, the subject matter is strictly scientific and serious in nature, being the results of much of the best neurologic research which this country produces, yet it is always readable, provocative, and stimulating. Not the least of its interest lies in the good discussions of each paper. It has become a rule that this annual publication is one of

highest quality; this latest volume is no exception to the rule. The opinions of philosophers, theologians, logicians, psychologists, and other arm-chair researchers are happily omitted. This book has to do with the role which the *brain* may or does play in the function of the "mind."

The opening paper by Lashley is not only scientific, but also a fresh and stimulating expression of one man's opinion, a great thinker and neurologist, and whether one agrees with all his thoughts one must admit the healthful quality of his reasoning which so thoroughly debunks much of both old and new explanations of the mind, based upon thin logic, philosophy, and Christian morals. In brief, he finds the mind, not yet completely defined to be sure, to lie within definite neurologic-physiologic patterns, but he confesses that the nature of those patterns is as yet far from completely understood.

The several papers probe the relationship of the mind to the frontal, temporal and parietal lobes, to the periamygdaloid area, the corpus callosum, to certain hormones, and to various electrical and biochemical reactions of the brain, and the facts presented are solidly based upon both human and animal experimentation.

The membership list at the back of the book is more or less a "Who's Who" of American neurology, neuroanatomy, and neurophysiology. The book is well indexed, and, as always, beautifully printed.

JOHN MARTIN, M.D.

THE PSYCHOLOGY OF MEDICAL PRACTICE. By Marc H. Hollender, M.D., Professor and Chairman, Department of Psychiatry, State University of New York. W. B. Saunders Company, Philadelphia and London. Price \$6.50.

More and more is being written about doctor-patient relationship. It is an important subject that deals with the souls of individuals, the ill themselves, and those concerned with the ill, relatives for instance.

This book is full of helpful suggestions on the handling of situations which physicians are daily encountering: the patient who has cancer, the obstetrical patient, the surgical patient, the pediatric problems that are constantly arising—all are thoroughly considered.

The medical student, the younger physicians who are open to suggestions, and some of the older physicians who are seeking to establish better doctor-patient relationship will find the book useful.

R. E. B.



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*Eastman, N. J., Seibels, R. E.: J. Am. M. Ass. 139:16, 1949. Eastman, N. J.: South. M. J. 42:346, 1949.

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